ENGINEERING AND MINING JOURNAL

A McGRAW HILL PUBLICATION

APRIL 1952

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FOUNDED 1866

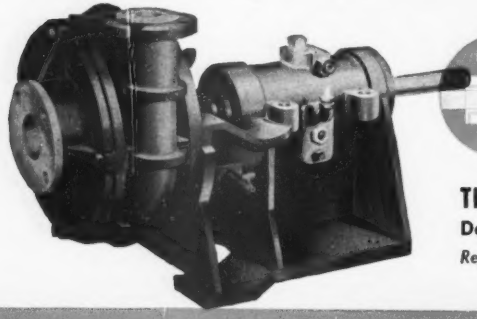
MECHANIZED TIMBER-HANDLING

JUST ONE OF HECLA'S COST-CUTTING IDEAS. See P. 72

Let's look at the record

This unretouched photograph shows the Maximix Rubber Shell Liner from a Hydroseal Sand Pump after it was taken from service. Here's how it compared with a metal pump casing of conventional design previously used in the same service:

	Metal Pump Casing Conventional Sand Pump		Maximix Rubber Liner HYDROSEAL Sand Pump	
WEIGHT OF PART	1,080	POUNDS	105	90% LESS
PUMPED PER DAY	4,000	TONS	11,000	175% MORE
SERVICE LIFE	100	DAYS	340	240% LONGER
TOTAL DELIVERY	400,000	TONS	3,740,000	835% MORE
COST PER TON	0.00284	$	0.000065	98% LESS



Results like this explain why Hydroseals are the choice of cost-conscious milling engineers the world over. Find out how their economy and efficiency can help you solve your pumping problem. Write for Catalog No. 451 today.

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MAXIMIX RUBBER PROTECTED

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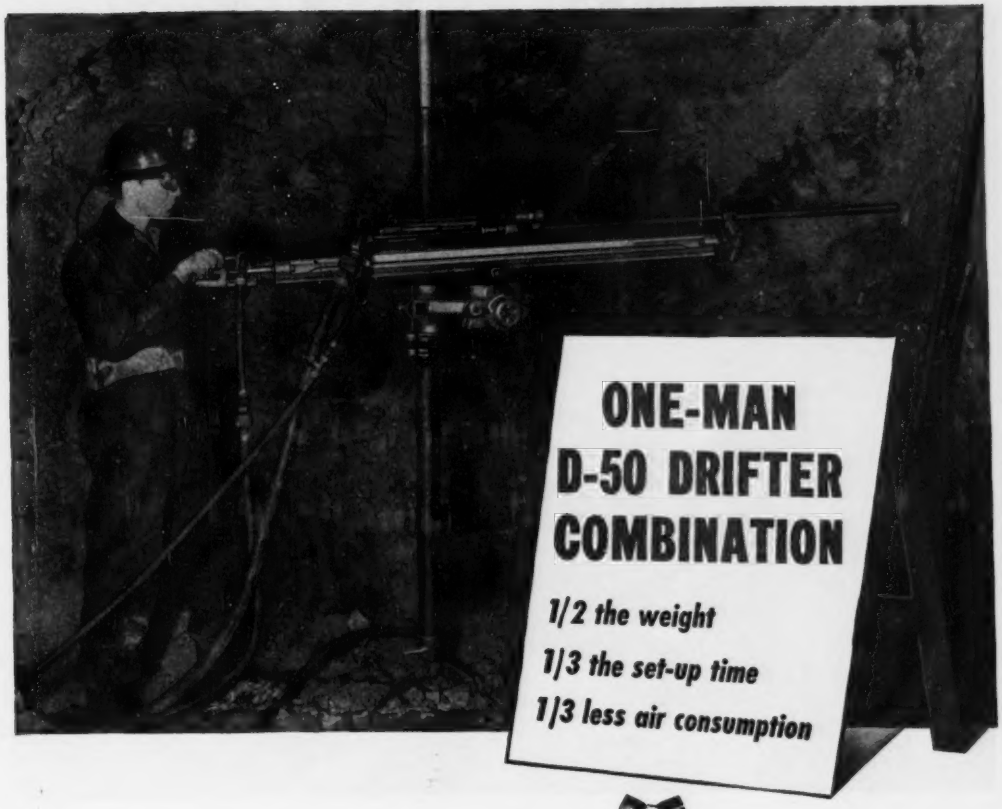


. . . designed to take full advantage of Carset Jackbits

This one-man D-50 Drifter Combination can save time, effort and expense in small headings and flat-hole stoping work. It has been developed specifically for use with Carset Jackbits—taking full advantage of their higher drilling speed and reduced power requirements.

Extreme light weight has been achieved by the relatively smaller size of the drill—aluminum shell mounting—aluminum alloy arm and clamps—and pneumatic column with aluminum piston. These weight savings, together with improved, quick-acting clamps and air-operated column, permit fast, easy, one-man set-ups. The strength and rigidity of the entire assembly permits accurate placement of holes in any type of rock. And lower first cost, lower replacement-part cost, plus reduced compressed air requirements mean big savings all along the line.

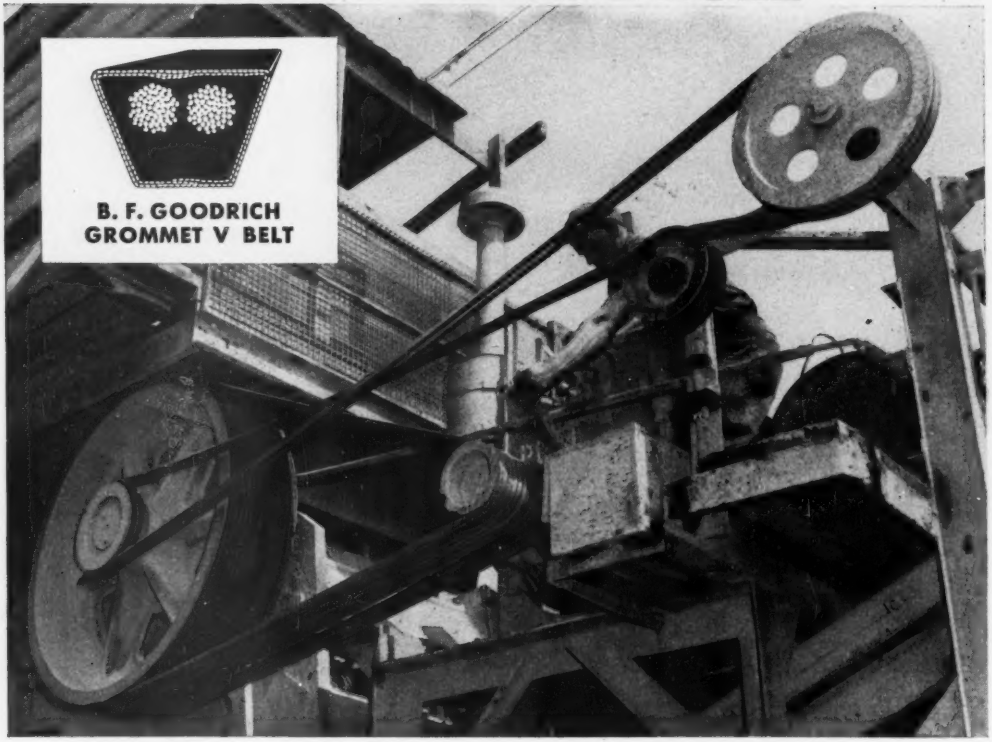
The complete equipment includes: the D-50 Drifter with automatic air-water backhead; faster PF3 power feed motor; light-weight aluminum shell for 30, 36 or 48 inch feed changes; sturdy arm and clamp assembly; and the D-11 pneumatic column with strong, leak-proof control valve built into the base. Plus, of course, longer-lasting, faster-drilling Ingersoll-Rand Carset Jackbits.

Your nearest I-R representative will be glad to give you complete information. Or write for your free copy of new Bulletin No. 4118.

Ingersoll-Rand

736-5 11 BROADWAY, NEW YORK 4, N. Y.

RESEARCH KEEPS **B.F.Goodrich** FIRST IN RUBBER



Three years at hard labor for B. F. Goodrich grommet belts

B. F. Goodrich grommet V belts cut costs 20 to 50%

POUNDING action of this machine put terrific shock and strain on the V belts. Belts are outdoors, have to stand rain, dust and dampness. When belts wore out, work stopped—costs went up by the minute.

Then a B. F. Goodrich man suggested using B. F. Goodrich grommet V belts. When the picture above was taken, the grommet belts had been in use 3 years, and looked good for a lot more service. BFG grommet belts look the same as ordinary belts but, because they are made in an entirely different way, grommet belts stand more shocks and heavier loads than any other kind. Here's why:

No cord ends—A grommet is endless, made by winding heavy cord on itself to form an endless loop. It has no overlapping ends. Because most of the failures in ordinary V belts occur in the region where cords overlap, the endless cord section in a grommet V belt eliminates such failures.

Concentrated cord strength—All of the cord material in a B. F. Goodrich grommet multiple-V belt is *concentrated* in twin grommets, positioned close to the driving faces of the pulley. No layers of cords to rub against one another and generate heat; cord and adhesion failures are reduced.

Better grip, less slip— Because a grommet is endless, a grommet V belt is more flexible, grips the pulleys better. Size for size, grommet multiple-V belts will give ⅓ more gripping power, pull heavier loads with a higher safety factor.

Only B. F. Goodrich has the grommet!— No other multiple-V belt is a grommet V belt (U. S. Patent No. 2,233,294). Now available in C, D and E sections. See your local B. F. Goodrich distributor. *The B. F. Goodrich Company, Industrial & General Products Division, Akron, Ohio.*

Grommet V Belts BY
B.F.Goodrich
RUBBER FOR INDUSTRY

ENGINEERING AND MINING JOURNAL

VOLUME 153 — 86th YEAR OF PUBLICATION — NUMBER 4

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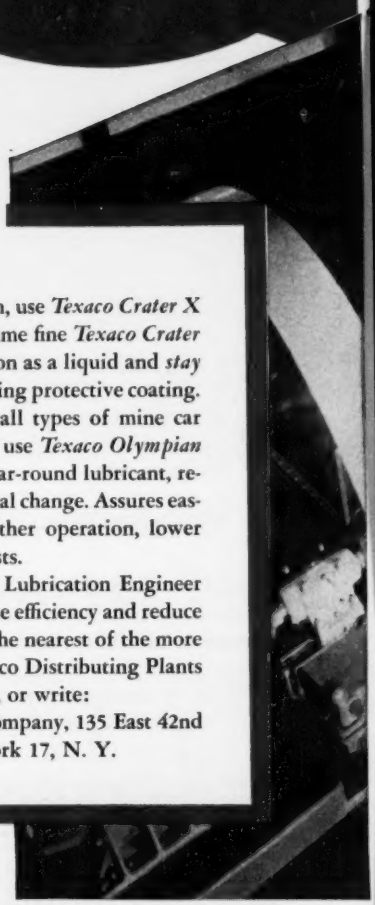
KEEP YOUR WIRE STRONG LONGER



★ Lubricate with TEXACO CRATER

Whether your wire rope is above ground or below, under cover or exposed to weather, you can keep it strong longer by lubricating with *Texaco Crater*. This is the famous *penetrating* lubricant. It gets into the rope and protects the core. It surrounds each metal strand with a tough, long-lasting film that guards against wear and rust even under severest conditions.

Texaco Crater also assures longer life and better service from your open gears. It protects the teeth with a tough, clinging film that absorbs shocks, muffles noise and reduces wear.

If you prefer the convenience of fluid application, use *Texaco Crater X Fluid*. It's the same fine *Texaco Crater* designed to *go* on as a liquid and *stay* on as a long-lasting protective coating.

To lubricate all types of mine car wheel bearings, use *Texaco Olympian Grease*. It's a year-round lubricant, requires no seasonal change. Assures easier starts, smoother operation, lower maintenance costs.

Let a Texaco Lubrication Engineer help you increase efficiency and reduce costs. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write:

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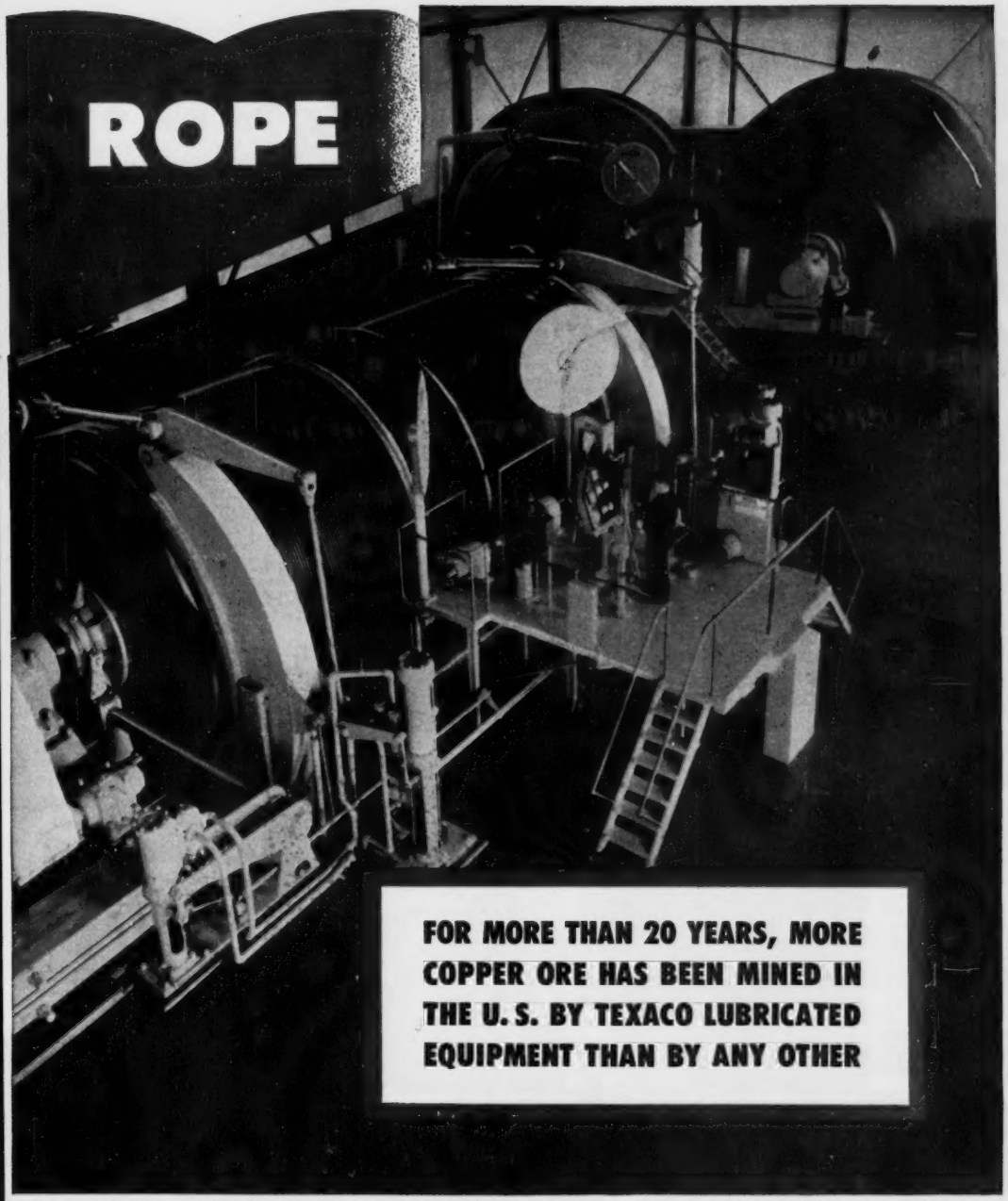


FOR MORE THAN 20 YEARS, MORE COPPER ORE HAS BEEN MINED IN THE U. S. BY TEXACO LUBRICATED EQUIPMENT THAN BY ANY OTHER

Lubricants and Fuels
FOR THE MINING INDUSTRY

Faithfully yours
50
for Fifty Years

UNDERGROUND, OR . . . .

IT'S JOY EQUIPMENT

Right: The Joy Drillmobile, a twin-boom, self-propelled, highly maneuverable machine, gives you maximum footage at least cost per foot of hole. Features Joy Hydro Drill Jibs for fast, accurate hole-positioning, and remote control.

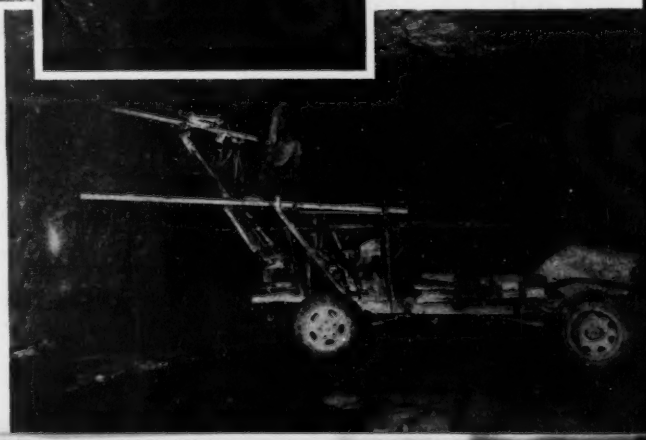
Above: For high-production loading and haulage of rock and ore, Joy teams of trackless loaders and electric or diesel shuttle cars get the call underground.

Right: Complete range of Joy Stopers includes the new S-91T, with telescopic feed. Requires fewer steel changes, gives more time for drilling.

Below: Joy Wagon Drill specially adapted to drill at any height from toe-holes to horizontals 9' high.

Left: The Joy HS-15 high speed drill for underground blast holes, or core drilling to 300'. Compact and easy handling, with "in-line" vibrationless drive.

Below: Joy Hydro Drill Jibs are versatile units; can be mounted as required to suit individual needs. This truck-mounted Jib is an example.

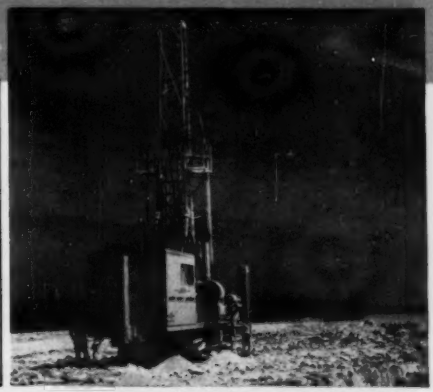


. . . ON THE SURFACE

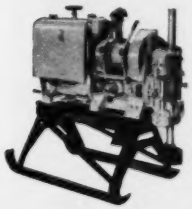
FOR GREATER TONNAGE FOR LOWER COSTS

Above: Joy builds a complete line of "Silver Streak" Hand Tools, cadmium-plated for rust protection and easier running in.

Above: Joy Wagon Drills (Medium and Lightweight models) are easily maneuvered units with positive locking brakes for quick set-ups and balanced drilling on any terrain.

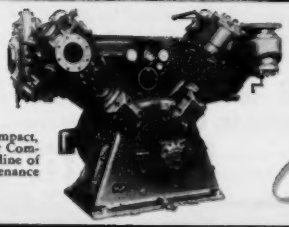


Above: Joy Champion Rotary Drills set absolutely new standards in high-speed, economical blast hole drilling, far outperforming all others. Built in two self-propelled models, for diesel, gasoline engine or electric motor drive.



Above: Joy Core Drills range in capacity from 250 to 1750 feet of 1¼" hole. Screw feed or hydraulic types—gasoline, diesel, air or electric drive.

Above: Joy Hydro Drill Jibs are readily adaptable to truck-mounting, etc. for secondary drilling or toe-holes in quarries or open-cut mining.



Left above: Joy's popular Series 80 Portable Compressors, with the famous "Econo-Miser" load control, are built in seven sizes, from 60 to 630 CFM.

Right: Joy pioneered the compact, modern "package-type" Air Compressor—offers a complete line of highly efficient, low maintenance airplants up to 3656 CFM.

Consult a Joy Engineer

WAD M-8365

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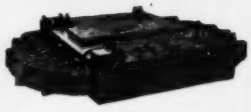
MAGNETIC PULLEYS?

Powerful, air cooled electro magnetic pulleys are ideal where well loaded conveyor belts are used. Installed as head drive pulley, tramp iron is discharged automatically. Low operating cost, long life and extreme power characterize this workhouse of the Dings line. Catalog C-1001A tells you why this magnet is exceptionally efficient.

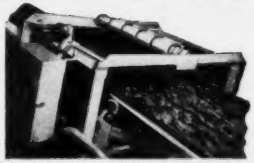
Dings *non-electric, self-energized* Perma Pulley magnets are recommended where burden depths do not exceed 3". Within this range, these are the magnets to use because of their unsurpassed concentration of magnetic strength near the surface. Catalog C-1007A.

SUSPENDED RECTANGULARS?



Power close and power that searches down as deep as 30" to yank tramp iron out. If the Dings RM rectangular won't do it, it can't be done. Triple pole, double gap design. Install horizontally, vertically or at an angle above belt conveyors or in chutes. Self-cleaning fully automatic models also available. Write for details.

MAGNETIC DETECTOR?



The Dings Magnetic Detector instantly signals when any magnetic object large enough to be damaging passes through the detector zone. Can be hooked up to sound an alarm and stop the belt. Ideal protection for crushers, grinders, pulverizers, etc., where belt speeds are so excessive or burden depths so great no magnetic separator can function successfully. Detectors are available for belt widths from 18" to 72". Two types are available. One employs an electro magnet and the other, a permanent magnet. Performance of the two is comparable.

Magnets shown here are available in size ranges for most applications. Special magnets can be made for any application. Write today for recommendations.

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Dings Certified MAGNETIC STRENGTH

Small Stripper finds the Answer

Thompson Coal Company produces 300 yards per day with an International TD-18A stripping and conveyor loading.

Where one tractor has to do the whole job, International's easy handling and high work capacity make a real difference in daily production.

At the Thompson Coal Company, Matoaka, West Virginia, an International TD-18A handles all the tractor work alone.

Here's what Ray Thompson has to say about it:

"This TD-18A has more power than any other tractor its size I've ever used before. We strip overburden, clean around the shovel and feed coal to loading conveyor with it. It has let us step up production considerably. For a small stripper, it's the answer!"

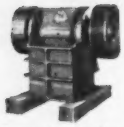
Whether you strip, with a single tractor or a fleet, let your International Industrial Distributor show you how to get more work done per equipment dollar with International power. He has the facts and the figures on the job International "power that pays" can do for you.

INTERNATIONAL HARVESTER COMPANY, CHICAGO 1, ILLINOIS

ONE MAN GANG. Thompson's steady-working International TD-18A is shown stock piling to prepare for conveyor loading of trucks. In addition, this handy tractor strips, makes roads and cleans loading area.

INTERNATIONAL HARVESTER

POWER THAT PAYS



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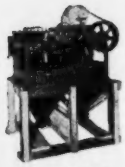
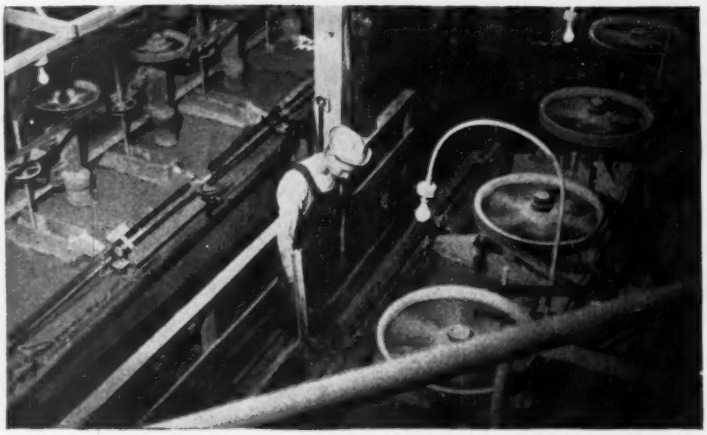
Denver Steel-Head Ball Mills

Denver Cross-Flow Classifiers



Denver Selective Mineral Jigs

Denver SRL Pumps



A 6-cell and 9-cell No. 21 Denver Sub-A roughing and cleaning fluorspar at Ozark Mahoning Fluorspar Mill, Jamestown, Colo.

Denver Super Agitator and Conditioners

Denver Disc Filters

Denver Ore Feeders

Denver Reagent Feeders

Denver-Buckman Concentrators

OVER 95% of ALL FLUORSPAR FLOTATION in the WORLD is by DENVER "SUB-A"

—another example of why there are more Denver "Sub-A" roughers and cleaners—*probably more than all other flotation machines combined!*

Cone Reagent Feeder

Denver Thickeners

Roughing and cleaning are particularly important in acid-grade fluorspar flotation. Here again the NET RESULT—*and it is the NET RESULT that means profits*—is definitely in favor of Denver "Sub-A" Flotation.

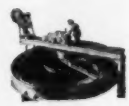
Denver "Sub-A" roughers and cleaners—probably more than all other flotation machines combined—*are giving the best NET RESULTS* on all kinds of minerals in all parts of the world.

Today, even with increased demand for Denver "Sub-A" Flotation no mill will be satisfied with less than Denver "Sub-A" efficiency. *Proof of this fact is the many operations now changing to Denver "Sub-A" Flotation!*

If you are expanding production, planning a new mill or modernizing your flotation section, write to Denver Equipment Company—for 25 years the world's leader in Flotation Engineering.

Denver "Sub-A's" are standard flotation machines. They are flexible to meet changing conditions of your ore. They are built to give your mill operator the tools he needs *to get results that pay greatest profits!*

Vertical Sand Pump



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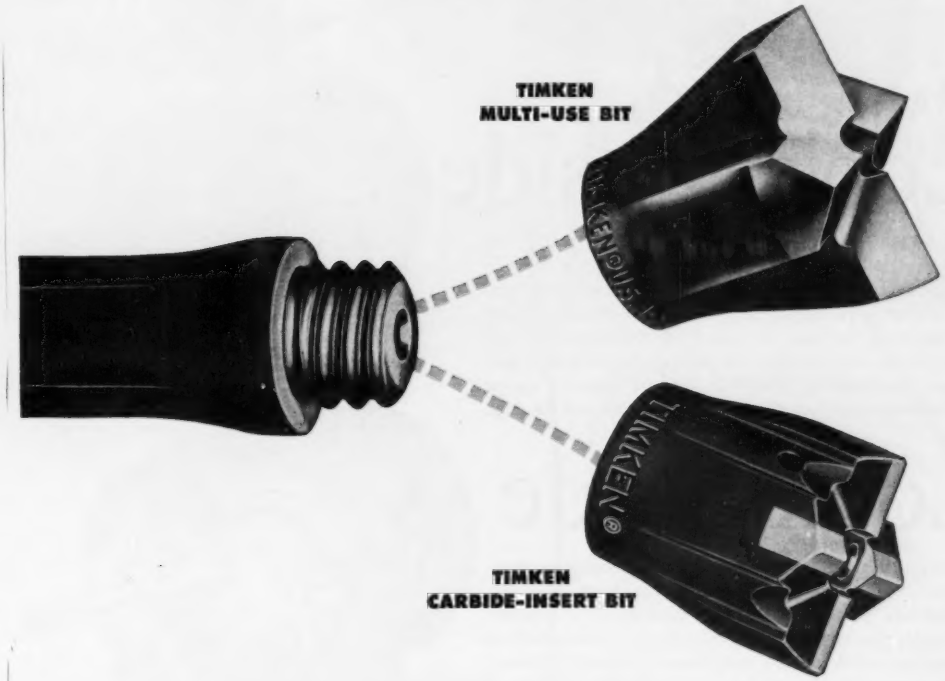
SWITCH TO THE BEST BIT FOR THE JOB, RIGHT ON THE JOB



WHEN there's variable ground in the same property you can save drilling time and whittle your labor costs by using interchangeable Timken® rock bits.

Use Timken carbide insert bits to get through hard ground in a hurry. Switch to Timken multi-use bits when you run into softer ground. Both types fit the same threaded drill steel.

With correct and controlled reconditioning, Timken multi-use bits give you the lowest cost per foot of hole when full increments of steel can be drilled.

Timken carbide insert bits are the most economical bits for hard and abrasive ground, and your best bet for maximum speed, constant-gauge holes, small diameter blast holes and very deep holes.

Team up the two of them and you'll always have the best answer to every drilling need right at your finger tips.

Timken carbide insert bits and multi-use bits are interchangeable in each thread series. And remember that both types of Timken bits have these three important advantages: 1) made from electric furnace Timken fine alloy steel, 2) threads are not subject to drilling impact because of the special shoulder union developed by the Timken Company, 3) quickly and easily removable.

Call upon the 20 years' experience of our Rock Bit Engineering Service for help in selecting the best bits for *your* job. Write The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".

Timken threaded multi-use rock bit

Timken threaded carbide insert rock bit

TIMKEN

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your best bet for the best bit
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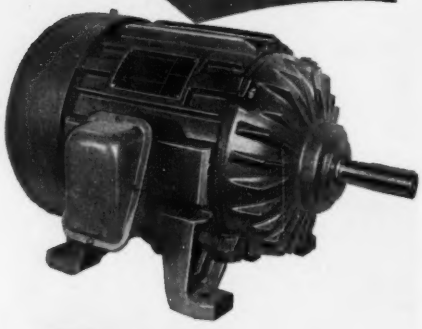
ALLIS-CHALMERS

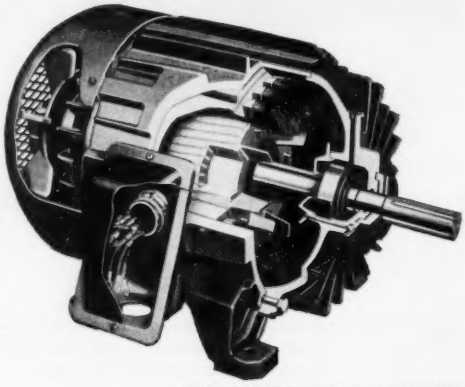
Totally-Enclosed Fan-Cooled MOTORS

Look Outside



Greatly increased radiating area means greater cooling efficiency. More important, cooling efficiency stays high, regardless of operating conditions. There are no enclosed external air passages to clog and cause overheating. If oily dirt sticks, just wipe or blow it off. No matter how bad operating conditions are, this motor can be easily kept clean and cool running. Electrical parts are protected against corrosive atmospheres by cast iron yokes and end housings.

Look Inside



Double-shielded, heavy-duty ball bearings require no maintenance in ordinary service under most conditions. However, they can be lubricated without disassembly if required. Double shielding prevents over-lubrication, leading cause of bearing trouble. Rotating seals, where shaft extends through housings, keep dirt and moisture out of bearing chambers. Die cast rotor and interphase insulation are further assurance of long life and low maintenance.

See WHY THIS IS YOUR BEST MOTOR BUY

HERE IS A MOTOR that is different from conventional TEFC motors; built with an entirely different cooling system that gives you big savings in lower maintenance, more continuous service and less trouble in the toughest locations. Clogging can easily be prevented in the Allis-Chalmers Type APZ TEFC motor since areas that might collect dirt are exposed and easy to clean.

GET DETAILS NOW — *Ask your nearby Allis-Chalmers Authorized Distributor or District Office for more complete information on this high performance TEFC motor. Or write direct to Allis-Chalmers, Milwaukee 1, Wisconsin. Ask for Bulletin 51B7225.* A-3578

Texrope and Vari-Pitch are Allis-Chalmers trademarks.

Sold . . .
Applied . . .
Serviced . . .

by Allis-Chalmers Authorized Dealers, Certified Service Shops and Sales Offices throughout the country.

CONTROL — Manual, magnetic and combination starters; push button stations and components for complete control systems.

TEXROPE — Belts in all sizes and sections, standard and *Vari-Pitch* sheaves, speed changers.

PUMPS — Integral motor and coupled types from ¾ in. to 72 in. discharge and up.

ALLIS-CHALMERS

ELIMINATE THE SHOCK OVERLOADS

NORTHWEST ADVANTAGES MEAN LOWER OPERATING COSTS

BEFORE THE DAMAGE IS DONE!

● THE Northwest Cushion Clutch in the Main Drum Clutch eliminates *shock overloads* *before* the overload reaches the machinery, not *after* they have been carried through the machinery with resulting strain and possible damage.

Protective devices at this point (between the engine and operating machinery) act after the shock load has passed through shafting and gearing. The Northwest Cushion Clutch catches the overload caused by the inertia stored in the rotating parts ahead of the engine.

The Cushion Clutch is a simple, positive device. The joint at "B" remains closed until overload point is reached. An overload causes the joint to open through the driving pin "A" and the clutch slips enough to cushion the shock of the load. The clutch is adjusted by the turnbuckle "C" There is no other adjustment.

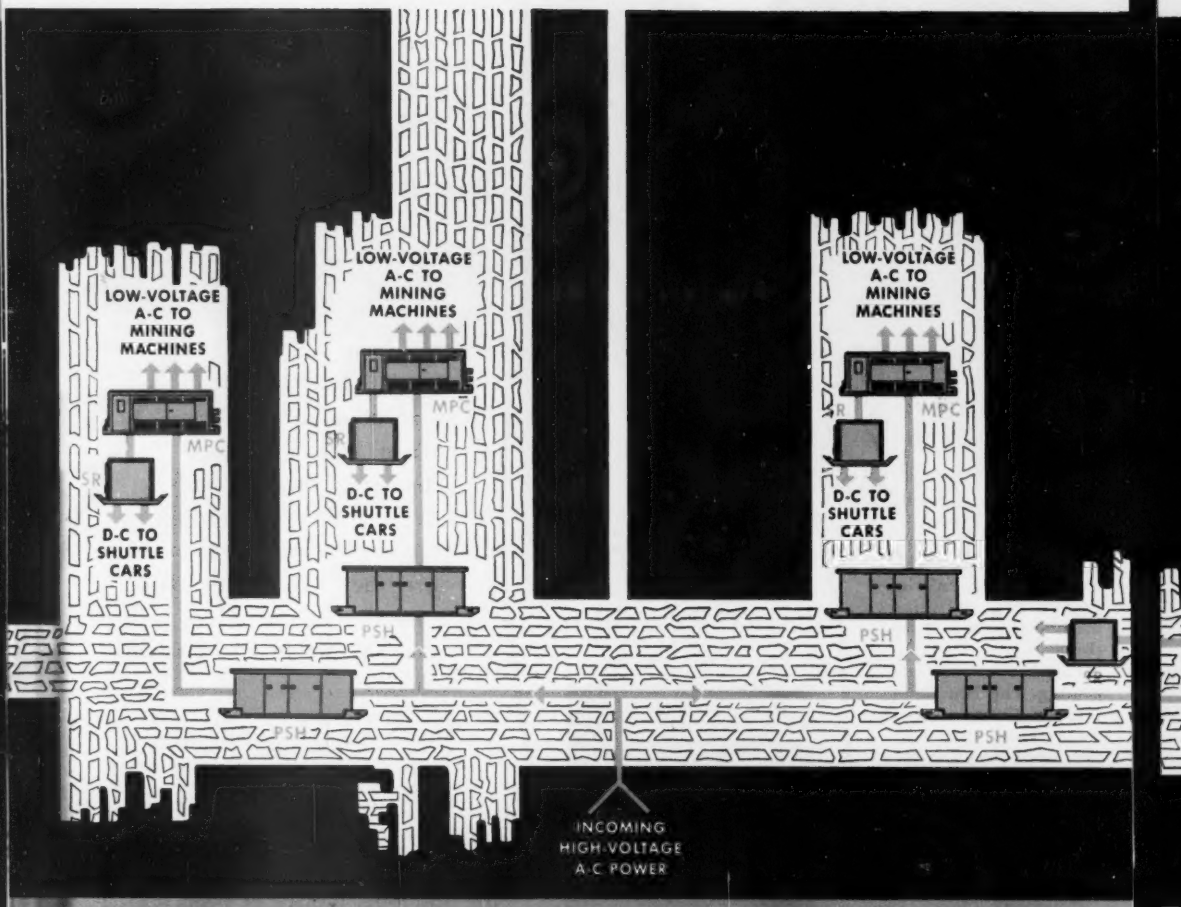
The Northwest Cushion Clutch reduces overloads on the drum shaft and associated parts. It results in reduced frequency of adjustments. It lengthens machine life and puts money in your pocket by reducing wear and tear.

NORTHWEST ENGINEERING COMPANY
1509 Field Building, 135 South LaSalle Street
Chicago 3, Illinois

Your Northwest is a real Rock Shovel and if you have a real Rock Shovel you never have to worry about output in any other kind of digging.

Convertible for Any Mining, Material Handling or Excavation Problem

NORTHWEST

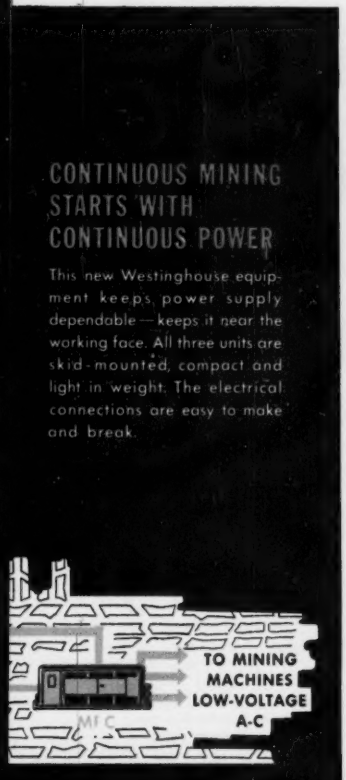


PSH—Portable Switch-house

MPC—Mine Power Center

SR—Selenium Rectifier

Three new developments for A-C power systems


CONTINUOUS MINING STARTS WITH CONTINUOUS POWER
This new Westinghouse equipment keeps power supply dependable—keeps it near the working face. All three units are skid-mounted, compact and light in weight. The electrical connections are easy to make and break.
TO MINING MACHINES LOW-VOLTAGE A-C

Here's the latest and best in power supply for a-c mining—three brand-new Westinghouse developments for use underground. Chart at left shows how they're applied.

1. New switch-house controls high-voltage power

High-voltage power comes down a shaft or borehole, then is sent out through individual feeders to the various working areas. Each feeder should be protected. Best way: the new Westinghouse underground switch-house. It immediately isolates the feeder in event of ground-fault, overcurrent or short circuit so that the rest of the system isn't affected.

2. Mine Power Center transforms it down

This new Mine Power Center keeps power supply where it's needed—close to the working face. Four working areas and four Power Centers are shown at left. This new unit is basically an air-cooled transformer with outgoing low-voltage feeders. A circuit breaker protects each feeder against overcurrent and ground-faults.

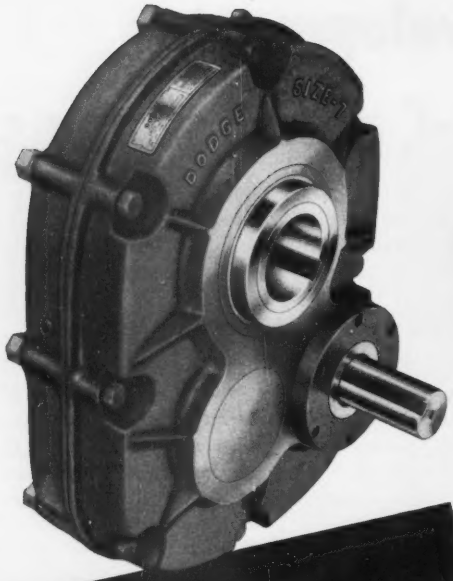
3. New rectifier supplies small blocks of d-c

Here's the ideal way to supply the small amounts of d-c needed in a-c mines. The new Westinghouse selenium rectifier takes a-c from the Power Center and supplies d-c through circuit breaker protected outlets. There are no major moving parts in this unit—the rectifier itself is a simple, static, plate-type device.

Call Westinghouse early on EVERY job

Westinghouse has a great deal of experience in all types of electrical equipment for mining. We can help you cut costs and improve your operations. When your next project comes up, call your Westinghouse office early in the planning stage. And for more information on these three new developments, write for B-5423. Westinghouse Electric Corporation, Box 868, Pittsburgh 30, Pa. J-94901

YOU CAN BE SURE... IF IT'S
Westinghouse
EQUIPMENT FOR THE MINING INDUSTRY



A NEW SIZE!

43 H.P.

DODGE TORQUE-ARM

The Speed Reducer that saves you real money!

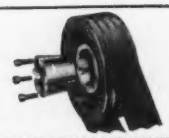
Here it is—the big size that enthusiastic Torque-Arm users have been asking for! Engineered for the same dependable performance and same economy that have made Dodge Torque-Arm Speed Reducers a nation-wide sensation.

- The new "big brother" of the famous Torque-Arm family. Double reduction. 43 hp capacity. Output speeds from 12 to 110 rpm.
- Rugged. Dependable. *Economical.* No special engineering required. No foundation to provide. No flexible couplings. No "lining up" difficulties. No expensive installation.
- Stock TAPER-LOCK sheaves prescribed for each job provide desired speeds. Applications to other machines is practical and easy.
- Unit is driven through any V-belt drive. A torque arm, fastened to any fixed object, anchors the reducer unit. Turnbuckle provides fast and accurate adjustment of belt tension.
- Backstop available from stock when required. Easily installed. Sealed and lubricated inside reducer housing.
- Dodge Tri-Matic Overload Release, which provides positive protection for driven machines both mechanically and electrically, is available from stock.
- Dodge Torque-Arm Speed Reducers are built in two series—Single and Double Reduction. Eleven sizes in all, with capacities from 1 to 43 hp and output speeds from 13 to 333 rpm. All available from distributors' stocks.
- WRITE for special Torque-Arm bulletin.

DODGE MANUFACTURING CORPORATION
3100 Union Street • Mishawaka, Indiana

DODGE
of Mishawaka, Ind.

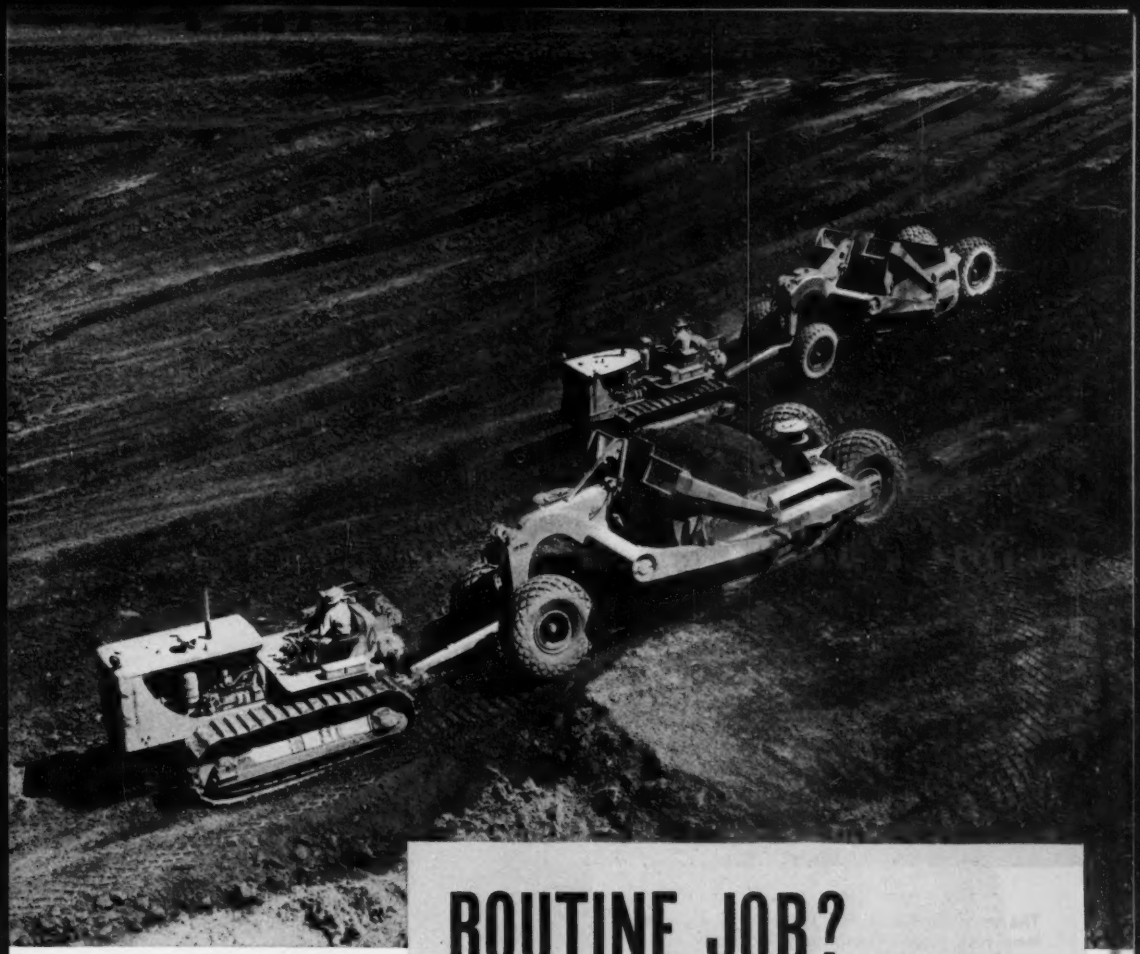
CALL THE TRANSMISSIONEER, your local Dodge Distributor. Factory trained by Dodge, he can give you valuable assistance on new cost-saving methods. Look for his name under "Power Transmission Equipment" in your classified phone book.



SEALED-LIFE V-BELTS AND TAPER-LOCK SHEAVES

DODGE-TIMKEN PILLOW BLOCKS

SOLID STEEL CONVEYOR PULLEYS



ROUTINE JOB?

Sure—for these scrapers!

THESE two "Caterpillar" teams—a D8 Tractor with No. 80 Scraper and a D7 with No. 70 Scraper—are stripping overburden from Bentonite deposits near Bell Fourche, S. D. Each pit in this operation contains from 40,000 to 50,000 cu. yds. of overburden, fine black sand mixed with rocky shale, which lies 20 to 30 feet over the deposits. The "Caterpillar" teams work 20 hours a day. On a 1,000-foot round trip, the D8 Tractor-Scraper unit averages 220 cu. yds. production per hour—the D7 unit, 185 cu. yds. per hour.

No matter where you put "Caterpillar" equipment to work, you can count on a good, honest day's job from it. Mr. Richard Busfield, partner in Busfield Brothers, phrases it this way: "We're well satisfied with these 'Caterpillar' machines. We've used 'Cat' equipment for years and know how dependable and rugged it is."

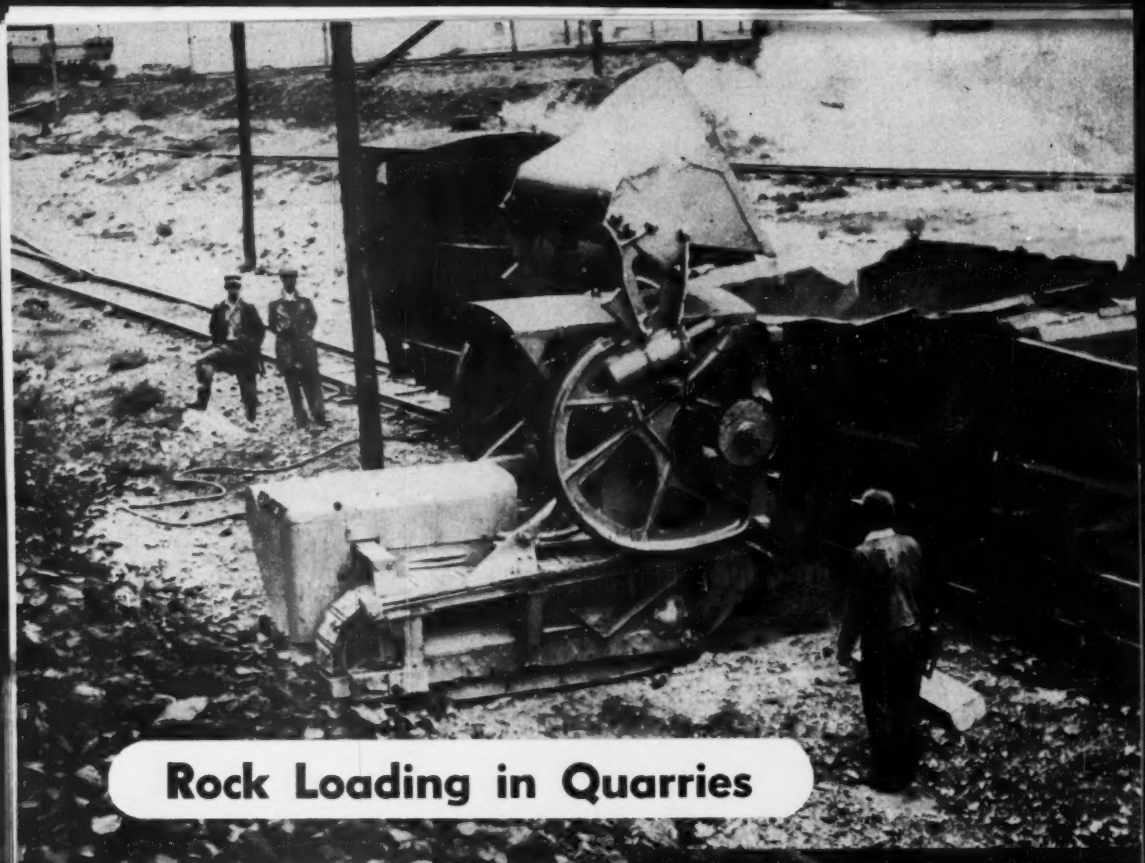
Production is vital to defense, and you can get peak production from your "Caterpillar" equipment by taking good care of it. That doesn't mean you have to coddle it. It's ruggedly built to stand up under tough going, but a few minutes' proper maintenance a day will add *extra* hours to its working life and lower your operating costs. Your "Caterpillar" Dealer is nearby to help. Make use of all he has to offer!

CATERPILLAR, PEORIA, ILLINOIS

CATERPILLAR

REG. U. S. PAT. OFF.

DIESEL ENGINES
TRACTORS • MOTOR GRADERS
EARTHMOVING EQUIPMENT

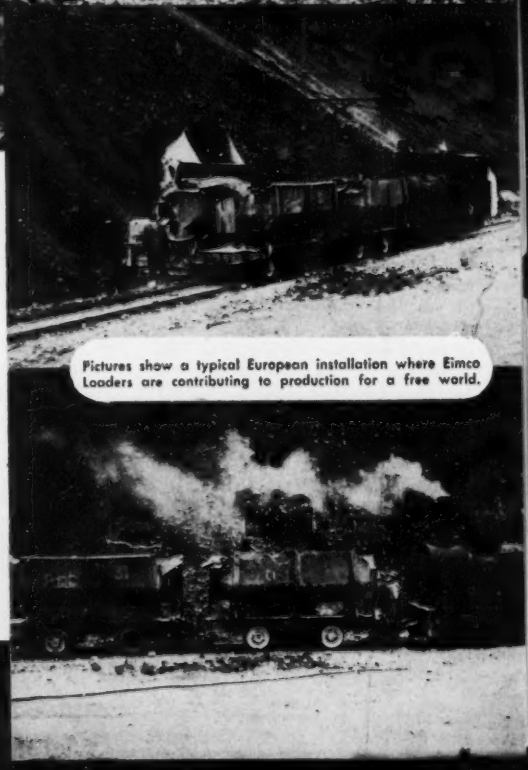


Rock Loading in Quarries

The versatile Eimco 104 loader will dig and load rock more economically than any other equipment.

It's easily moved from place to place in the quarry. Equipped with a 1¼ yd. rock bucket, the 104 will load at the rate of 4 to 6 yds. per minute.

Eimco 104's are low cost, high production, dependable loaders. Write for more information.



Pictures show a typical European installation where Eimco Loaders are contributing to production for a free world.

You Can't beat an Eimco

EIMCO

THE EIMCO CORPORATION

The World's Largest Manufacturers of Underground Rock Loading Machines

EXECUTIVE OFFICES AND FACTORIES – SALT LAKE CITY 10, UTAH, U. S. A.

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NEW YORK, 51-52 SOUTH STREET • CHICAGO, 3319 SOUTH WALLACE STREET
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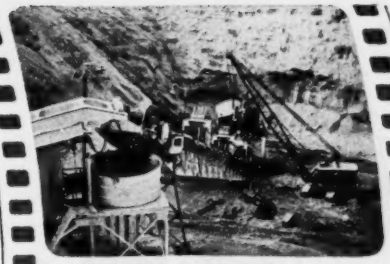
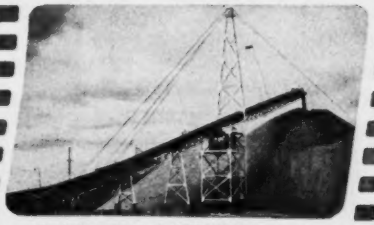
EL PASO, TEXAS, MILLS BUILDING • BERKELEY, CALIFORNIA, P. O. BOX 240
KELLOGG, IDAHO, 307 DIVISION ST. • LONDON W. 1, ENGLAND, 190 PICCADILLY

IN FRANCE: SOCIETE EIMCO, PARIS, FRANCE
IN ENGLAND: EIMCO (GREAT BRITAIN) LTD., LEEDS 12, ENGLAND
AGENTS IN ALL PRINCIPAL CITIES THROUGHOUT THE WORLD



Shovel and Diesel dragline feed ore through grizzly to 60" pendulum conveyor leading to portable crusher at start of 9-belt conveyor system.



Crushed gravel is stock-piled by 700-foot conveyor suspended from tower.

Reclaim tunnel (left) feeds conveyor to washing plant housing jigs, tables, amalgamators and grinders, and classifying units.

Boom stacker transfers sands from washing plant to waste pile.

High tonnage —low cost

Conveyor Belt System Makes Gold Mine "Pay"

OUTSTANDING mining operation in the western states, this gold mine has been handling up to 17,000 tons per day of porphyry gold since January 1950—all over a conveyor belt system belted according to the recommendations of the G.T.M.—Goodyear Technical Man.

Secret of the mine's success is the trouble-free performance of Goodyear Style B conveyor belting—designed to handle highly abrasive materials. If you have a bulk-load handling problem, it will pay you to consult the G.T.M. for conveyorization recommendations. See your nearest distributor of Goodyear Industrial Rubber Products, or write Goodyear, Akron 16, Ohio.

GOODYEAR INDUSTRIAL RUBBER PRODUCTS
GT-Specified STYLE B CONVEYOR BELT
for HANDLING ABRASIVE MATERIALS
A Tough cover resists abrasion and gouging
B Multi-plies of highest grade duck, frictioned with 16-19 pound stock for added flex-life
C Breaker strip gives further protection to carcass and resists cover stripping

LOOK FOR YOUR GOODYEAR INDUSTRIAL RUBBER PRODUCTS DISTRIBUTOR

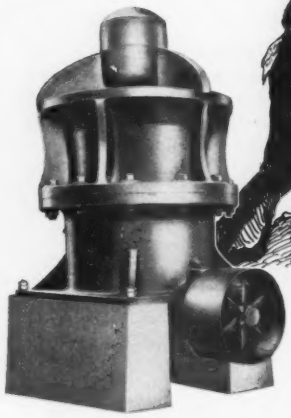
in the yellow pages of your Telephone Directory under "Rubber Products" or "Rubber Goods." He handles Hose, Flat Belts, V-Belts, Molded Goods, Packing, Tank Lining, Rubber-Covered Rolls built to the world's highest standard of quality.

GOODYEAR

THE GREATEST NAME IN RUBBER

the hard way . . .

This old Mexican method of crushing ore applied the simple laws of gravity and leverage—excellent principles but inefficiently used in this case.

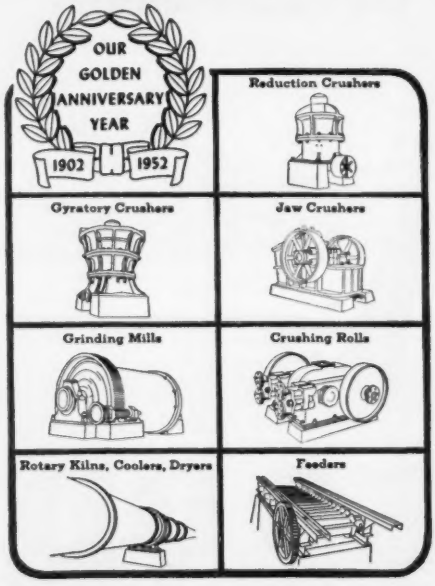


The Traylor TY Reduction Crusher is a perfect example of compact, simple design for efficient operation. For specifications and description, ask for Traylor Bulletin 6112.

THE MINING INDUSTRY passed through many interesting and unique phases before reaching its modern level of efficiency.

For 50 years, Traylor spearheaded its advancement by developing more efficient machinery for crushing ore. As processes and methods changed, Traylor took the lead in supplying new and improved equipment to fit each specialized job.

Mining men know that to solve new problems, there is no substitute for experience. Traylor has experience —half a century of it.



Traylor

ENGINEERING & MANUFACTURING CO.

452 MILL ST., ALLENTOWN, PA.

Sales Offices: New York • Chicago • Los Angeles
Canadian Mfrs: Canadian Vickers, Ltd., Montreal, P. Q.

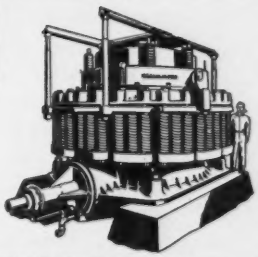
A TRAYLOR LEADS TO GREATER PROFITS

"Threads of Gold"
for a
ROMAN TOGA

The mineral *Chrysotile,* meaning golden fibers, or threads, supplies over 90% of the world's asbestos requirements. Called the "miracle mineral" by the ancients, the Roman naturalist Pliny (23—79 A.D.) refers to the use of such material as "a rare and costly cloth" used for the funeral garments of kings.

The secret of the great usefulness of asbestos lies in its unique combination of fibrous structure, fire and water resistance, flexibility and strength. Since the profitable recovery of asbestos fiber depends upon fine crushing without destroying fiber length, a crusher that will perform such functions economically, and will produce large quantities of finely crushed material, is essential.

Proof of the world-wide acceptance of *"SYMONS"* Cone Crushers in asbestos production is found in the field, where practically every major producer employs these high capacity, economical machines . . . *as in all of the great ore and industrial mineral operations the world over.*



"SYMONS" Cone Crushers . . . *the machines that revolutionized crushing practice* . . . are built in Standard, Short Head, and Intermediate types, with crushing heads from 22 inches to 7 feet in diameter—in capacities from 6 to 900 tons per hour. C252

NORDBERG MFG. CO., Milwaukee, Wisconsin

"SYMONS" . . . A NORDBERG TRADEMARK KNOWN THROUGHOUT THE WORLD

NORDBERG

MACHINERY FOR PROCESSING ORES and INDUSTRIAL MINERALS

NEW YORK · SAN FRANCISCO · SPOKANE · WASHINGTON · TORONTO
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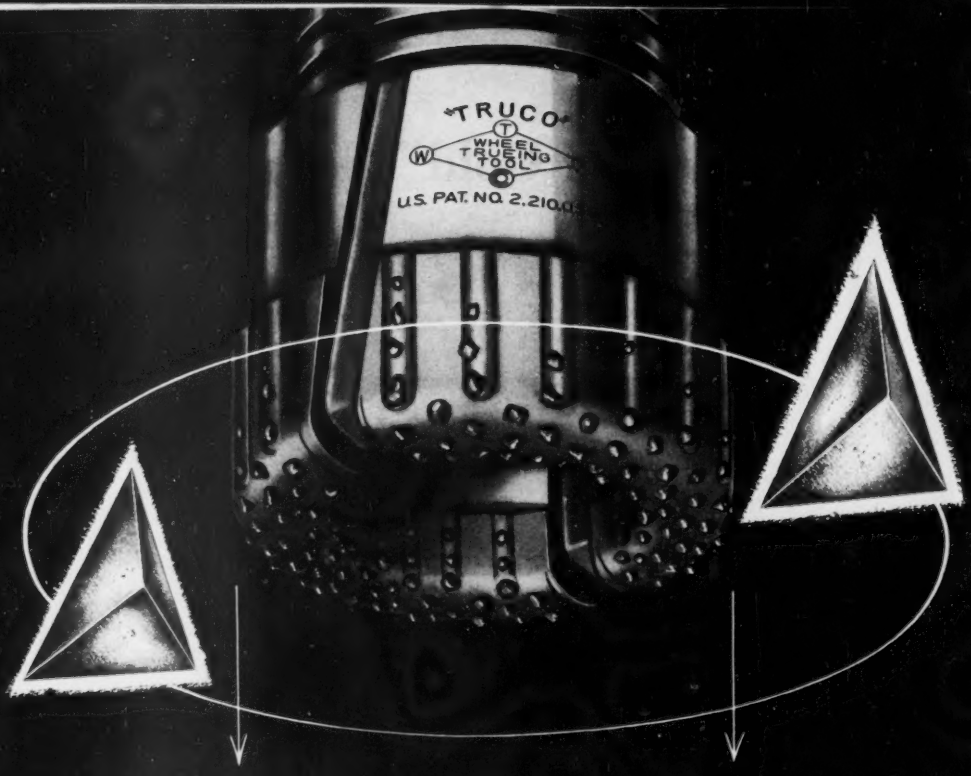


ATOMIC SCIENCE FOR DRILLERS

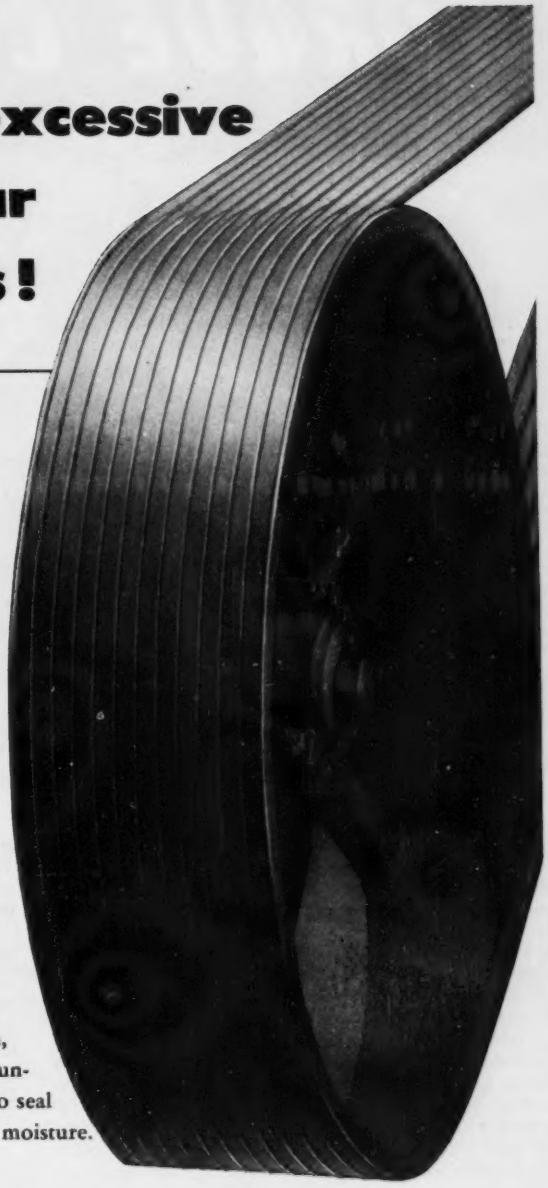
Every driller should know this much about atomic science; the diamond is the world's greatest cutting element because of its atomic structure.

It starts with a diamond atom shaped like one of the pieces shown above—a tetrahedron. Even the tiniest, fine industrial diamond contains billions of these tetrahedron diamond atoms, always arranged in the same crystalline formation, always producing the same atomic structure, and always with one important peculiarity: At each cleavage plane there is a "hard vector" or "rib" which is harder and has more cutting power than any other part of the diamond.

For centuries, it has been the objective of good diamond setting practice to locate the "rib" and set it "toward the work," as is done today in setting Truco Diamond Drill Bits, so that the driller gets the benefit of the diamond's utmost cutting power —delivered in the form of maximum footage at minimum cost.

WHEEL TRUEING TOOL COMPANY
3200 W. DAVISON AVENUE, DETROIT 6, MICHIGAN
WHEEL TRUEING TOOL CO. OF CANADA, LTD.
575 LANGLOIS AVENUE, WINDSOR, ONTARIO, CANADA

How to beat excessive Cover Wear on V-Belts!



1 Check sheaves for worn grooves

2 Check alignment between sheaves

3 Check tightness of sheaves on shafts

(Sheaves must be tight on shafts to hold proper alignment. Worn grooves result in uneven side wall wear or running on bottom corners of belts, causing premature failure.)

4 INSTALL BULL DOG V-BELTS . . . their wear-resistant, durable covers of closely woven, heavy, bias-cut fabric can take brutal punishment where belt meets sheave — also seal against penetration of dirt, grease and moisture.

Get the complete Bull Dog V-Belt quality story on covers, cords and compounds from your BWH distributor — soon.

BWH DEPENDABLE RUGGEDNESS

Another Quality Product of

BOSTON WOVEN HOSE & RUBBER COMPANY

Warehouse Stock: 111 N. Canal St., Chicago, Illinois **Distributors in all Principal Cities**

PLANT: CAMBRIDGE, MASS. • P. O. BOX 1071, BOSTON 3, MASS., U. S. A.

TORQUE CONVERTER

Adding a torque converter, electric shift, and electric steer control, to 19 m.p.h. Tournadozer is another development to help you move dirt faster and at lower costs. With these additional features Tournadozer becomes an even greater producer on high-speed pushing, pulling and dozing assignments. The single-stage torque converter is a simple, trouble-free type, which combines the advantages of a hydraulic torque converter and a fluid coupling. Teamed with the constant mesh transmission, it provides an infinite speed range from 0 to 19 m.p.h., and automatically selects the proper ratio for delivering maximum power in a steady, even flow to Tournadozer's wheels. This enables the engine to operate at maximum r.p.m. and at highest efficiency. Torque converter absorbs practically all shock-loads between engine and drive wheels . . . adds efficiency . . . means more work done dozing, climbing grades, pulling through mud, snow, ice, sand. It improves performance in any type of difficult operation, increases accuracy in holding cuts to grade and in close finishing.

Combining low-pressure, 21.00 x 25 rubber tires and constant-mesh transmission with torque converter, Tournadozer gives you the smoothest running dozer you've ever seen! You get instant speed selection at the touch of an electric switch . . . no delay . . . no de-clutching or loss of vital momentum for shifting gears.

Wheel speeds are automatically adjusted to give you maximum power delivery in gear range selected, thus eliminating shock loads or need for frequent gear change. With 4 forward speeds, 2 reverse, plus torque converter, you get an infinite speed range with most effective use of power over every foot of the way. This constant, smooth power, always available contributes to increased output plus lower maintenance and longer machine life.

Check all the advantages you get from new torque converter, plus the new electric shift and steer control, which combine to make Tournadozer by far the fastest, most efficient dozer money can buy. It will pay you to contact your LeTourneau Distributor . . . he'll be glad to show you how these advantages help Tournadozer to do more work on all your jobs per hour . . . per day . . . per year.

LETOURNEAU LET EQUIPMENT

HIGH-SPEED, RUBBER-TIRED EXCAVATING • HAULING • LIFTING EQUIPMENT

makes TOURNADOZER even greater producer

TORQUE CONVERTER gives you all these advantages

1 **Smooth acceleration**—infinite speed range 0 to 19 m.p.h., more work done on the level, up steep grades, or in soft going.

2 **Better traction**—steady pull of smooth flowing power gives big, low-pressure tires a firmer grip in tough footings to pick up and carry bigger loads without slippage.

3 **Longer tire life**— peak loads in tire acceleration are eliminated, giving better wear, longer, more economical service.

4 **No shock or vibration** — shock loads of sudden speed increases are absorbed in oil of torque converter and eliminated from transmission and entire power train.

5 **Higher engine efficiency**— constant horsepower cuts down engine wear . . . eliminates lugging . . . reduces maintenance expense . . . adds to engine life.

6 **Steady engine speed**—assures maximum voltage to electrical equipment . . . improves service and life of engine attachments.

7 **Accurate grading** — smooth, perfect balance of torque against load gives accurate control of blade at all times.

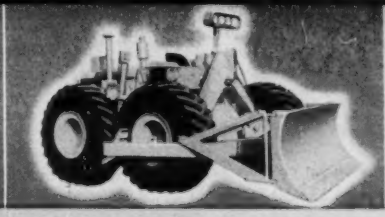
8 **Single-stage torque converter** — simple and trouble-free . . . not dependent on seal efficiency for converter efficiency.

9 **Easier operation** —smoother performance throughout cycle increases operator efficiency . . . boosts your production.

10 **More yards per hour**—use of maximum engine horsepower gives higher average speed, higher ratio of operating efficiency, more work done.

Check additional attachments available below

Down pressure blade (optional) — now available, assures quick positive penetration in wet frozen sand, clay, hardpan, other hard materials. Electrically-operated PCU, plus short-coupled cable gives fast, smooth blade control.



Angledozer — simplifies side-hill work. 13' x 41½" blade can be angled 25° right or left . . . is easily interchanged with standard bulldozer blade. V-type snow plow also available for smashing big drifts, extra winter earnings.

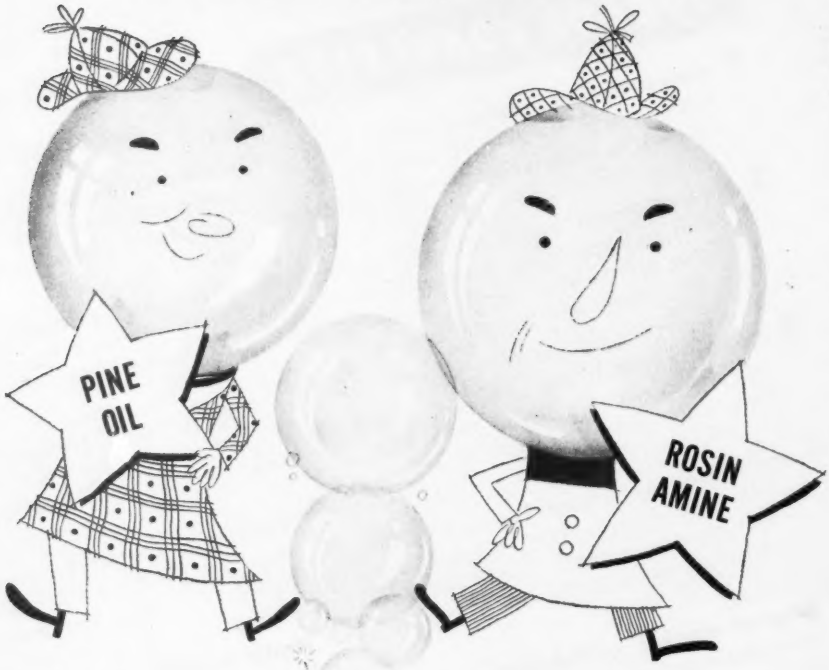
Logging winch — exerts 67,000-lb. line pull . . . plenty of power for any winch application. Push button controlled and powered by two 2-speed electric motors. Big sheave fairlead permits pulls to 90°. Tops for heavy skidding!

R. G. LeTOURNEAU, INC.

PEORIA, ILLINOIS

Use these "Agents"

FOR BEST RECOVERIES



115-S

Frothers

HERCULES YARMOR® F PINE OIL
Standard of quality among pine oil frothers since the early days of flotation. Yarmor F Pine Oil produces a strong froth of good volume, satisfactory texture, and excellent cell-life stability.

Collectors

RADA (Hercules Rosin Amine D Acetate)
Siliceous mineral collector that has good solubility and handles easily.

Rosin Amine Derivatives: Special purpose collectors; uses vary with type of materials to be floated.

Technical information on these and other flotation aids is available. Send for 16-page booklet "Flotation and Hercules Flotation Agents."

HERCULES Flotation Agents

HERCULES POWDER COMPANY Naval Stores Department, 933 King Street, Wilmington 99, Delaware

NM52-1

Will a MANCHA pay in your mine?

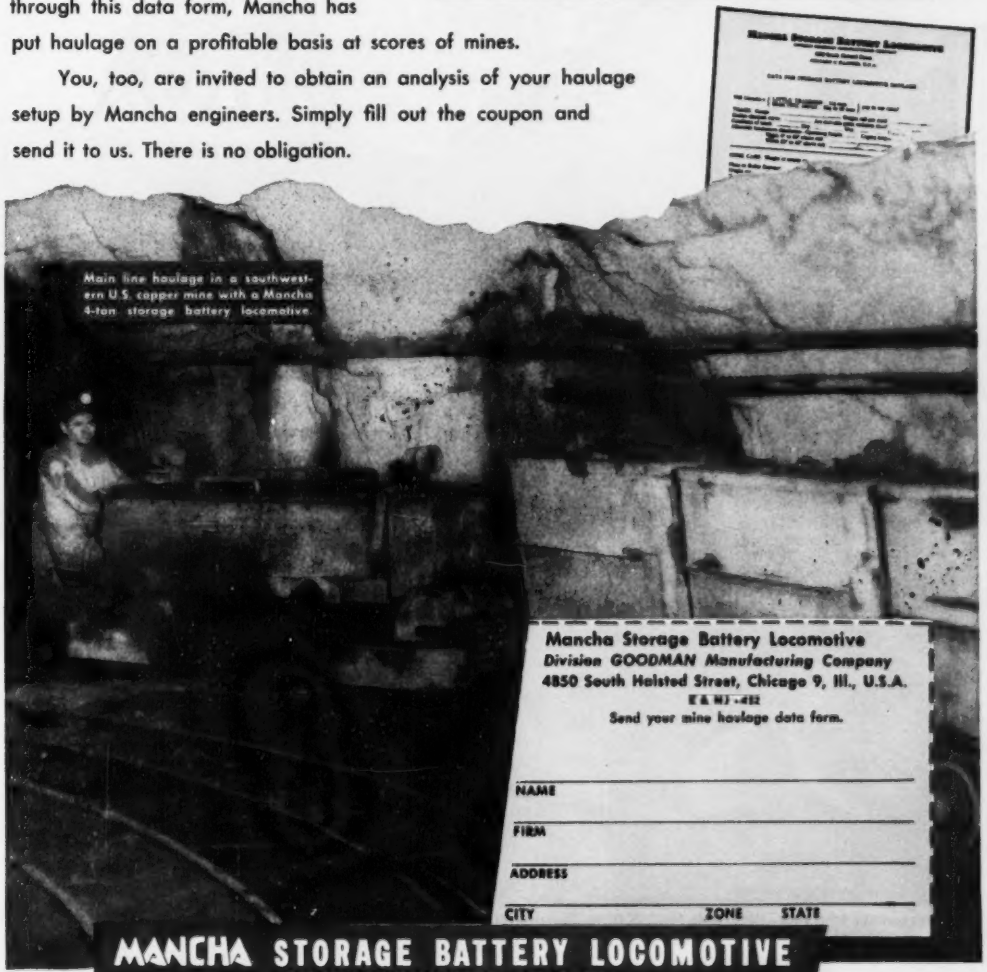
Storage Battery Locomotive

The Mancha haulage data form is a report sheet designed to help us determine the maximum output that can be secured at any mine, with Mancha Storage Battery Locomotives.

Using the information made available through this data form, Mancha has put haulage on a profitable basis at scores of mines.

You, too, are invited to obtain an analysis of your haulage setup by Mancha engineers. Simply fill out the coupon and send it to us. There is no obligation.

Whether or not you intend to buy today—send for our mine haulage data form . . .
Get the answer now!



Main line haulage in a southwestern U.S. copper mine with a Mancha 4-ton storage battery locomotive.

Mancha Storage Battery Locomotive
Division GOODMAN Manufacturing Company
4850 South Halsted Street, Chicago 9, Ill., U.S.A.
E & MJ-452
Send your mine haulage data form.

NAME _____

FIRM _____

ADDRESS _____

CITY _____ ZONE _____ STATE _____

MANCHA STORAGE BATTERY LOCOMOTIVE
Division **GOODMAN** *Manufacturing Company*
4850 SOUTH HALSTED STREET CHICAGO 9, ILL., U. S. A.

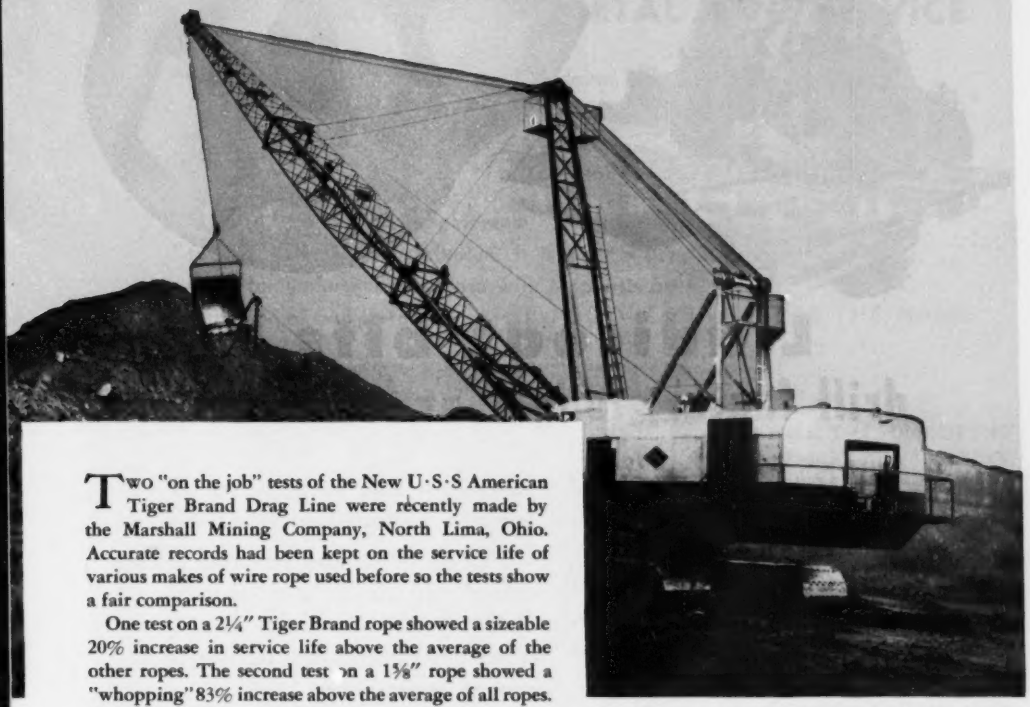
New American Tiger gives 20% to 83%

SAVES MONEY AND TIME—INCREASES PRODUCTION. This new Tiger Brand Drag Line Rope quickly pays for itself through increased life and greater production. Try it next time you have to replace your drag rope.

20% INCREASE IN WIRE ROPE LIFE. When this 14 cu. yd. drag line was equipped with the new Tiger Brand 2¼" Drag Line, the average service life of the rope was increased 20% over other brands tested.

USS
AMERICAN
TIGER BRAND
WIRE ROPE
UNITED STATES STEEL

Brand Drag Line increase in service life



Two "on the job" tests of the New U·S·S American Tiger Brand Drag Line were recently made by the Marshall Mining Company, North Lima, Ohio. Accurate records had been kept on the service life of various makes of wire rope used before so the tests show a fair comparison.

One test on a 2¼" Tiger Brand rope showed a sizeable 20% increase in service life above the average of the other ropes. The second test on a 1⅜" rope showed a "whopping" 83% increase above the average of all ropes. Digging conditions in all cases were the same.

This new Tiger Brand Drag Line was designed especially to resist the severe operating conditions imposed by this class of service.

The use of this new rope on your drag line will mean substantial savings in your wire rope costs. It will cut your down time and help to keep machines at top capacity.

DRAG LINE LIFE INCREASED FROM 600 HOURS TO 1100 HOURS —83%. The best service on this drag line using 1⅜" rope averaged 600 hours for other brands of rope. But with the new U·S·S Tiger Brand Rope, service life jumped to 1100 hours—almost double the previous average.

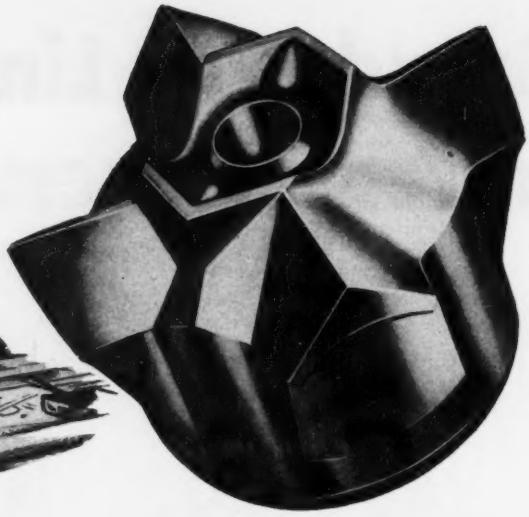
U·S·S AMERICAN TIGER BRAND WIRE ROPE

AMERICAN STEEL & WIRE DIVISION, UNITED STATES STEEL COMPANY, GENERAL OFFICES: CLEVELAND, OHIO
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO · TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA., SOUTHERN DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

Excellay Preformed

UNITED STATES STEEL

Why search further? ⇨⇨



Liddicoat bits
drill faster, longer at less cost!

Action packed Liddicoat bits are designed for fast cutting performance and long cutting life at low initial cost per bit to give lowest cost per foot of hole drilled. Used to equal advantage in drifting, stoping, raising or sinking, a handful of Liddicoat bits literally does a whole shift's drilling.

Liddicoat two-stage cutting action and special wing design guarantees speed and long gauge life by retaining cutting edges and reaming edges.

Since resharpening is not involved, Liddicoat bits are designed for only one purpose . . . maximum drilling efficiency. These bits actually chip out rock instead of battering it until pulverized as do more expensive, ordinary conventional bits.

Your search for faster and better drilling ends if you join the ever expanding list of the world's outstanding mining and contracting concerns now receiving distinguished service from Liddicoat's unsurpassed detachable rock bits.

PILOT CONSTRUCTION

Section "AA", along the high-centre wings. Section "BB", along the low-centre wings.

WESTERN
Rock Bit Manufacturing Company
552 West 7th South • Salt Lake City 4, Utah

"Every Little Bit Counts"

BELT TRANSPORTATION WITH A GOODMAN ENDORSEMENT...

Goodman

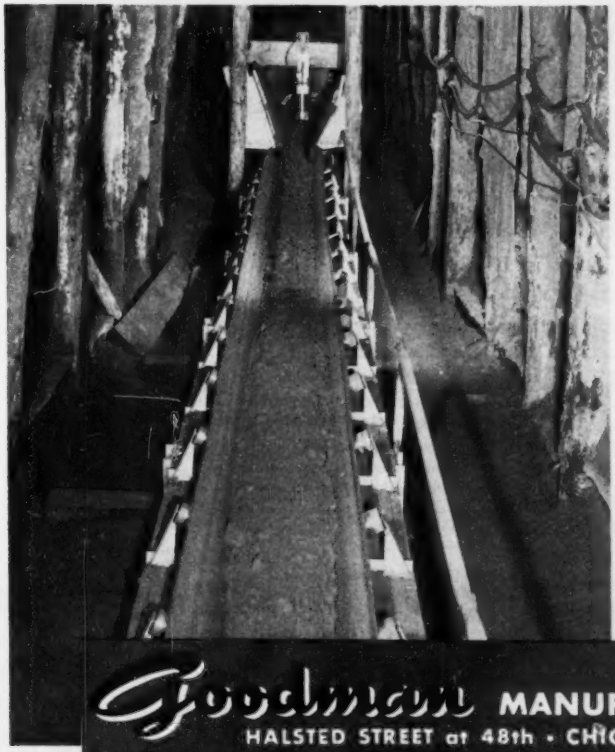
TYPE 99 BELT CONVEYOR

PATENTED

FOR HEAVY DUTY METAL MINE SERVICE

When you buy a Type 99, the Goodman name, with its reputation for quality and "know-how" in the mining industry, assures you of complete satisfaction. THE NAME PROTECTS THE PRODUCT!

The Type 99 is 3-way engineered — from design to manufacture to installation. It is built especially for underground service with emphasis on compactness and portability. THE PRODUCT PROTECTS THE NAME!



THESE ARE SOME OF THE TYPICAL ADVANTAGES FOUND IN THE GOODMAN TYPE 99:

1. Easily installed and extended
2. Accurate alignment at all times
3. No anchors required
4. Complete electrical units
5. The best in belting to meet the job

Your inquiry for a *complete* conveyor engineered to suit your conditions is welcomed.

Goodman MANUFACTURING COMPANY
HALSTED STREET at 48th • CHICAGO 9, ILLINOIS

Denver "Sub-A" Flotation

Denver-Dillon Vibrating Screens

Denver Hydroclassifiers

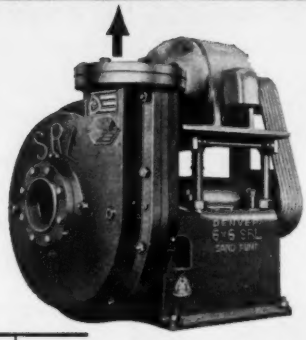
Denver Reagent Feeders

Denver Steel-Head Ball Mills

LOWER COST PUMPING *IS* possible with DENVER SRL Rubber Lined Pumps

Denver-Buckman Concentrators

Here's Why—Rubber resists abrasive wear. Pressure molded rubber wearing parts average from 1 to 2 year's service on abrasive mill pulps. 3 year's continuous service without shutdown for parts is common. Service life is 6 to 50 times that of hard iron or alloy steel.



Denver Cross-Flow Classifiers

Examples of DENVER SRL Rubber Lined Pump Curves*

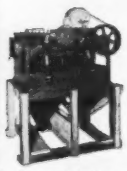
Size	Gals. of water per minute		20′ head	40′ head	60′ head	80′ head	100′ head
2″×2″ SRL	50	RPM	838	1090	1320	1525	
		HP	.60	1.5	2.8	3.2	
3″×3″ SRL	100	RPM	760	1053	1303	1453	
		HP	1.1	1.9	3.4	4.3	
5″×5″ SRL	300	RPM	590	800	956	1087	
		HP	2.4	5.4	8.3	11.5	
6″×6″ SRL	1000	RPM		862	1005	1122	
		HP		14.4	22.6	30.0	
3″×3″ SRL-C	150	RPM	870	1145	1385	1580	1745
		HP	1.5	3.2	5.3	7.2	9.6
5″×4″ SRL-C	350	RPM	655	850	1020	1160	1280
		HP	2.9	5.4	8.3	11.4	14.5
8″×6″ SRL-C	800	RPM	500	655	780	890	980
		HP	5.7	11.6	16.8	22.3	28.6
10″×8″ SRL-C	2000	RPM	485	610	710	800	855
		HP	14.0	27.8	41.2	56.3	71.6

*(*Multiply these horsepower ratings by the specific gravity of your pulp to determine actual brake horsepower required.)*

Denver Ore Feeders

Denver Disc Filters

Your savings on parts is only a portion. Real savings is in fewer shut-downs. Moreover, simple, split-case design, and few parts mean renewing worn parts is fast; lost time is negligible.



Denver Selective Mineral Jigs

Lower Horsepower

Power cost is 30% to 70% less than for other sand pumps on similar service. *Reason:* greater hydraulic efficiency resulting from simple design, rubber parts and lighter weight. Accuracy of rubber parts results in 1½ to 3 times greater efficiency than other sand pumps.

Learn more about actual savings

If you pump —¼" abrasives, describe your pumping requirements. Let us study and report specific advantages of Denver SRL Rubber Lined Pumps over pumps you now use. Write today.

Bulletin P9-B6

Denver Jaw Crushers

Complete milling equipment from testing to feeder to dryer. Many of these items are in stock.

DENVER EQUIPMENT 24 HOUR SERVICE COMPANY

FLOTATION ENGINEERS

DENVER • NEW YORK • CHICAGO • EL PASO

TORONTO • VANCOUVER • MEXICO, D. F.

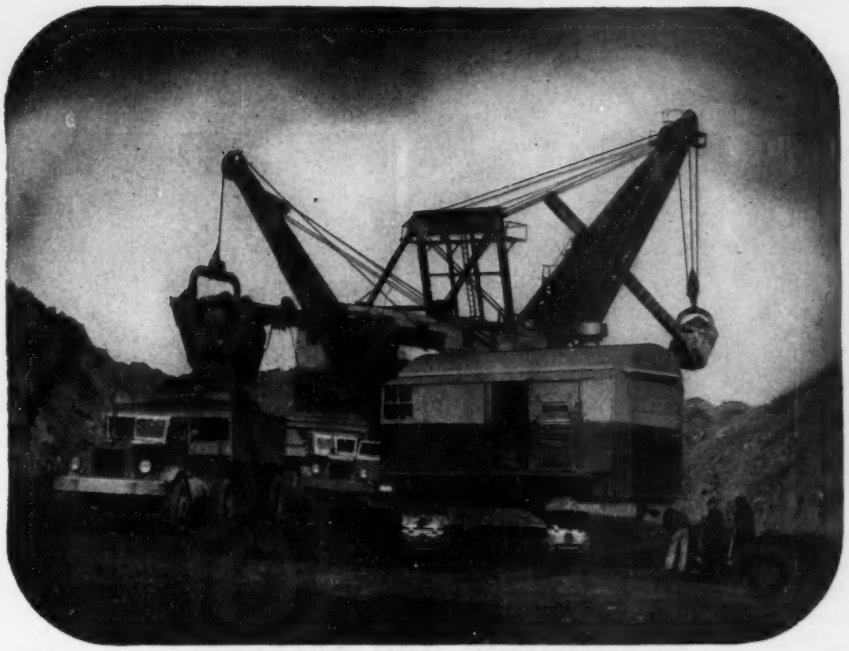
LONDON • JOHANNESBURG • RICHMOND, AUST.

"The firm that makes its friends happier, healthier, and wealthier"

DENVER EQUIPMENT COMPANY

1400 SEVENTEENTH STREET • DENVER 17 COLORADO

WIRE ROPE



This is the most economical rope we've ever made for mining

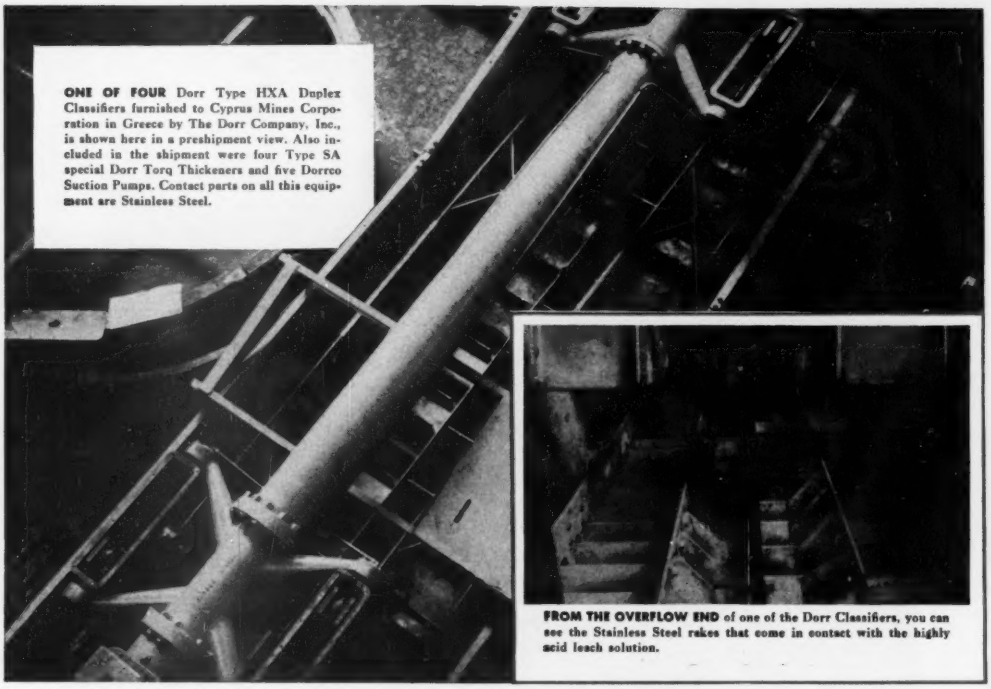
ROEBLING is the best known name in wire rope. That's partly because we were the first wire rope maker in America. But more than that, we've always led in developing better wire and better rope for every purpose.

Today's Roebling Preformed "Blue Center" Steel Wire Rope is the miners' best choice for efficiency and long life. This rope has *extra* resistance to crushing and abrasion . . . stands up under rough going. It saves you time and cuts costs.

There's a Roebling wire rope of the right specification for top service on any job. Call on your Roebling Field Man for his recommendations. John A. Roebling's Sons Company, Trenton 2, N. J.

ROEBLING

ATLANTA, 934 AVON AVE • BOSTON, 51 SLEEPER ST • CHICAGO, 5525 W. ROOSEVELT RD • CINCINNATI, 3253 FREDONIA AVE • CLEVELAND, 701 ST. CLAIR AVE, N. E. • DENVER, 4801 JACKSON ST • DETROIT, 915 FISHER BLDG • HOUSTON, 6216 NAVIGATION BLVD • LOS ANGELES, 5340 E. HARBOR ST • NEW YORK, 19 RECTOR ST • ODESSA, TEXAS, 1920 E. 2ND ST • PHILADELPHIA, 230 VINE ST • SAN FRANCISCO, 1740 17TH ST • SEATTLE, 900 1ST AVE S. • TULSA, 321 N. CHEYENNE ST • EXPORT SALES OFFICE, TRENTON 2, N. J.



ONE OF FOUR Dorr Type HXA Duplex Classifiers furnished to Cyprus Mines Corporation in Greece by The Dorr Company, Inc., is shown here in a preshipment view. Also included in the shipment were four Type SA special Dorr Torq Thickeners and five Dorrco Suction Pumps. Contact parts on all this equipment are Stainless Steel.

FROM THE OVERFLOW END of one of the Dorr Classifiers, you can see the Stainless Steel rakes that come in contact with the highly acid leach solution.

For acid leaching of copper ore, you need Stainless Steel's resistance to corrosion and abrasion

With today's emphasis on more and more metal production, little-used methods of ore recovery are getting careful attention. Many of them, like acid leaching of oxidized copper ore, put heavy demands on equipment . . . demands that can be best met with corrosion-resisting, abrasion-resisting U·S·S Stainless Steel.

In order to improve the metallurgical recovery of copper from their ores, Cyprus Mines Corporation in far-off Greece is acid leaching oxide copper and brightening copper sulphide materials ahead of flotation. For this job, all contact parts in the leaching equipment, including Dorr Thickeners, Classifiers and Suction Pumps, are made of Stainless Steel to resist the sulphuric acid leach solution.

Stainless Steel combines its exceptional corrosion resistance with a tough, durable surface that withstands day-in, day-out wear and abrasion. In one material, it gives you the answer to two of the mining industry's most severe problems—corrosion and abrasion.

When you consider its long life and its freedom from costly maintenance and shutdowns, you'll find Stainless the most economical material you can use.

And you'll get the finest performance from Stainless equipment when it is built of perfected, service-tested U·S·S Stainless Steel. Our engineers will be glad to tell you more about the properties of various grades of U·S·S Stainless Steel and how they will fit into your equipment picture.

U·S·S STAINLESS STEEL

AMERICAN STEEL & WIRE . . . . COLUMBIA-GENEVA STEEL . . . . NATIONAL TUBE . . . . TENNESSEE COAL & IRON

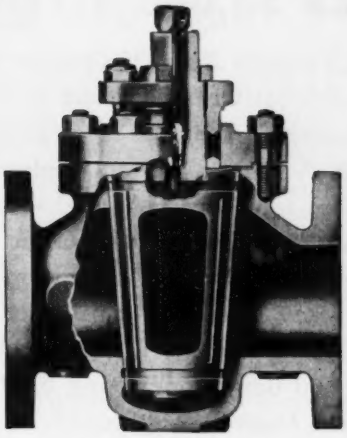
UNITED STATES STEEL SUPPLY, WAREHOUSE DISTRIBUTORS . . . . Divisions of UNITED STATES STEEL COMPANY, PITTSBURGH

UNITED STATES STEEL EXPORT COMPANY, NEW YORK

2-360

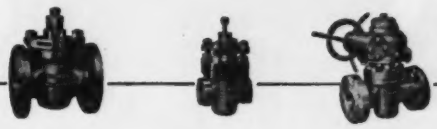
UNITED STATES STEEL

WALWORTH
Lubricated
Plug Valves



for TOUGH assignments

where tight shut-off...
and easy operation
are "MUSTS"



Walworth Lubricated Plug Valves Offer These Advantages

- Complete surrounding of ports with resistant lubricant affords positive seal against leakage.
- Lubricant grooving system assures ease of operation — tight shut-off — greater protection against corrosion.
- Body and plug fully protected by lubricant from attack by line fluids.
- Quarter turn opens or closes valve.
- Made in a complete range of sizes ½" to 26" and for pressures from 175 to 5,000 psi., and for vacuum requirements.

For handling petroleum products, natural or manufactured gas, acids, alkalies, solvents, slimes, slurries . . . in fact for almost any hard-to-handle liquids—there's a Walworth Lubricated Plug Valve designed for the job.

Easy to operate, tight sealing, resistant to wear and corrosion, Walworth Lubricated Plug Valves assure long years of dependable service at low operating cost.

Walworth Lubricated Plug Valves are available in sizes ½" to 26" for pressures from 175 to 5,000 psi., and for vacuum requirements. For full details—prices, sizes, dimensions, and other pertinent data, see your Walworth distributor or write to:

WALWORTH

valves • fittings • pipe wrenches

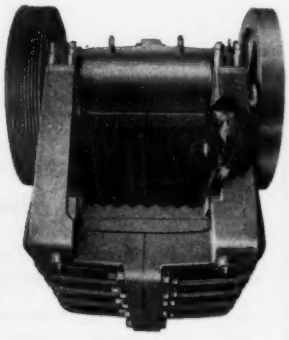
60 EAST 42nd STREET, NEW YORK 17, N. Y.

DISTRIBUTORS IN PRINCIPAL CENTERS THROUGHOUT THE WORLD

FLASH! FLASH!

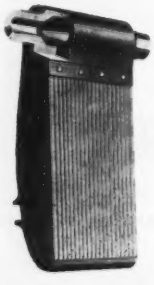
KVS CRUSHER DOUBLES OUTPUT— SAVES $3,000 A YEAR!

A Kennedy No. 37½ Crusher with a Special Grinding Ring 3″ Feed Opening gave 50% more product (and a finer, better product at that) for about HALF the power cost of a competitive crusher of a comparable size. With power costing say 1 cent per h.p. hour, this KVS saved some 40 h.p. (or about $11.00 daily) or around $3,000 a year. Need we say more?



FLASH!

LOAFER PUT TO WORK, PRODUCTION SOARS!

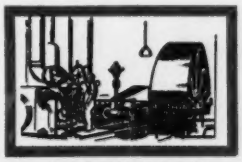


The "KVS" STATIONARY jaw never loafs because it carries 50% of the crushing load, instead of leaving it all to the SWING jaw. Production soars . . . and at the same time the Swing jaw is made stronger than ever. This jaw is ALL IN ONE PIECE, except for the crushing plate, with shaft cast integral—never can loosen! And the plate is removable and renewable. Note also — Swing and Stationary jaws are INTERCHANGEABLE, reversible end for end and side for side for DOUBLE jaw-crushing life.

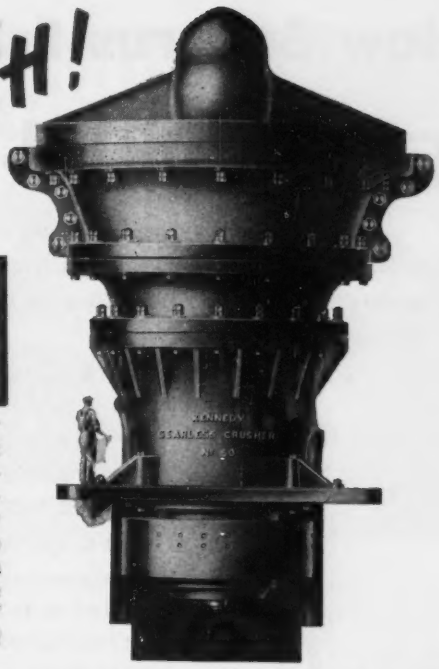
SAVE CASH IN A FLASH-

KVS GEARLESS GETS FREE POWER FROM OLD IDEA!

FLASH!



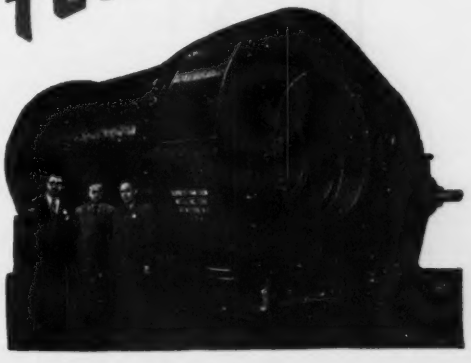
Grandpa had an idea that's good today! The big whirling flywheel or pulley of the old Corliss Engine produced extra KINETIC ENERGY! In other words, FREE power! Today the BIG Revolving Pulley in the "KVS" Roller Bearing Gearless does the same. It revolves at 3,500 ft. a minute—EXTRA crushing power without extra cost. The 11 ton pulley (in a "KVS" Gearless Crusher weighing 400,000 lbs.) turns so easy you can turn it on its roller bearings with two fingers. In few words — more CRUSHING with LESS POWER COST. Less vibration—less noise —and more important, less wear—puts the "KVS" Gearless way out in front — and keeps it there!



MILL BUYER POCKETS $5,000!

FLASH! FLASH!

This smart man was thinking of buying a 10′ diameter ball mill. He saved $5,000, maybe more, by buying a "KVS" Mill with INTEGRAL GEAR drive and using a SYNCHRONOUS MOTOR DIRECT CONNECTED to driving shaft. Pinion shaft runs about 600 r.p.m. Pinion shafts in other mills run at about 180 r.p.m. "KVS" trunnions on large sized tube and ball mills CARRIED ON OIL. Bearing never wears out, uses little power. All gears and bearings automatically oil-sprayed before mill is started (design pat'd).In 15 years on this type mill no "KVS" gears or pinions have ever worn out.



• **WRITE** today for complete set of "KVS" Bulletins if you want MORE production with LESS cost.

Kennedy-Van Saun

MANUFACTURING AND ENGINEERING CORPORATION

2 PARK AVE., NEW YORK 16, N. Y.

FACTORIES:
DANVILLE, PA., U. S. A.
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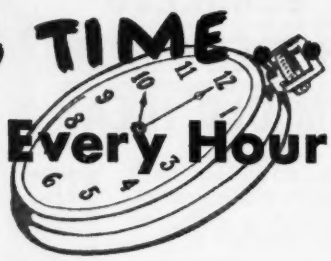
INVEST IN "KVS"

How Bucyrus-Erie Drills Give You

EXTRA DRILLING TIME . . .



Every Hour

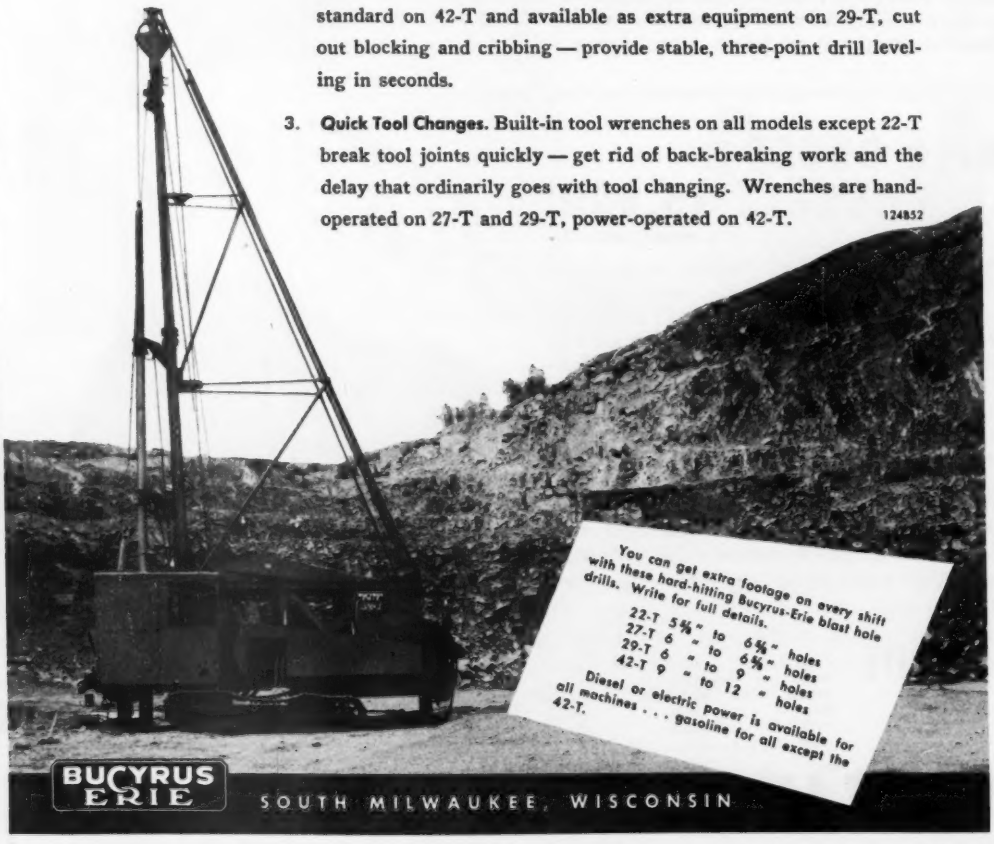
Hard-hitting Bucyrus-Erie blast hole drills cut waste time — spend more hours of actual drilling on every shift. Here are three big reasons why:

1. **Quick Moves.** Mobile caterpillar mountings permit quick moves — over rocky ground, through mud and sand, up steep grades. Steer just like a tractor. Controls are right at operator's station. Such mobility gives you extra time to make the most of the fast, rock-shattering Bucyrus-Erie drilling action.

2. **Quick Set-Ups.** Built-in leveling jacks eliminate time-wasting ground preparation — make possible quick, easy set-ups. Hydraulic jacks, standard on 42-T and available as extra equipment on 29-T, cut out blocking and cribbing — provide stable, three-point drill leveling in seconds.

3. **Quick Tool Changes.** Built-in tool wrenches on all models except 22-T break tool joints quickly — get rid of back-breaking work and the delay that ordinarily goes with tool changing. Wrenches are hand-operated on 27-T and 29-T, power-operated on 42-T.

124852


You can get extra footage on every shift with these hard-hitting Bucyrus-Erie blast hole drills. Write for full details.
22-T 5⅞" to 6¾" holes
27-T 6 " to 6¾" holes
29-T 6 " to 9 " holes
42-T 9 " to 12 " holes
Diesel or electric power is available for all machines . . . gasoline for all except the 42-T.
BUCYRUS ERIE
SOUTH MILWAUKEE, WISCONSIN

WANT TO "SHRINK" YOUR ALUMINUM CABLES?

It is easy to do if you know how. Here's how. To operate at the same temperature, your insulated aluminum cable would have larger size conductors to compensate for the reduced conductivity of aluminum. It follows then that your conduits, fittings and connectors would all have to be larger than for copper.

But if you buy a cable having approximately the same size aluminum conductor that you would ordinarily buy if you were using copper, the aluminum cable will run considerably hotter than a copper cable would under the same load. So instead of using conventional insulations, which are seldom rated more than 140 F. (60 C.), specify Simplex-Anhydrex XX insulation. This will help overcome the heat problem, where voltage drop will permit, because Anhydrex XX is rated at 176 F. (80 C.).

Simplex-Anhydrex XX insulation will operate at temperatures up to 176 F. (80 C.) in either wet or dry locations at voltages up to 17,000. That's how you shrink aluminum conductors.

If you must use aluminum because of the copper shortage, let our engineers help you with your problem.

We would be more than happy to give you the latest specification data on Simplex-Anhydrex XX insulation. Simply send your request to the address shown below.

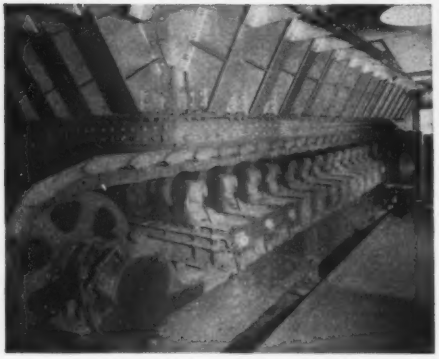
Simplex-Anhydrex XX is a product of Simplex Research.

SIMPLEX-ANHYDREX XX

SIMPLEX WIRE & CABLE CO.
79 Sidney St., Cambridge 39, Mass.

Plenty of Roughage in this Diet . . .

as S-A Pan Feeders handle ore up to 3000 tons per hour



CRUSHING PLANT

Rail cars dump ore from nearby open pit mines into receiving hoppers. Four AMSCO Manganese Steel Pan Feeders, mounted thirty feet below, have a combined capacity of 3000 tons per hour. Each feeder is 72" wide by 27' long. Ore moves in a measured flow from the dump hoppers to scalping screens and then to the crushing plant.

• **S-A Manganese Steel Pan Feeders have the stamina to withstand the endless punishment of thousands of tons of ore dumped onto them hour after hour, day in and day out. They assure uninterrupted flow of materials to the scalping screens—in uniform volume without under or overloading conveyors.**

AMSCO* manganese steel construction and S-A design combine to produce a unit which is incredibly sturdy—highly resistant to wear and abrasion. That means dependable service for many years *with minimum maintenance and spells low cost per ton operation.*

For fifty years S-A engineering has met and solved the toughest problems in bulk materials handling. Whether you plan to install new equipment, or enlarge your present set-up, you will benefit by the recommendations of S-A engineers. Write us.

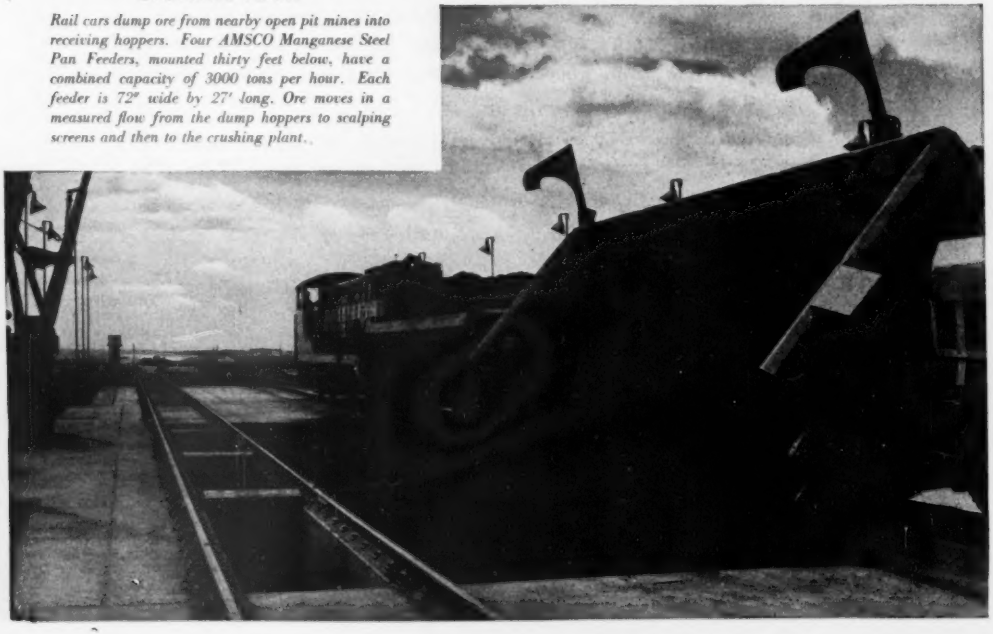
*T. M. Reg. American Brake Shoe Co.

1901-1951

50 years experience with bulk handling

STEPHEN S-A ADAMSON MFG. CO.

4 Ridgeway Avenue, Aurora, Illinois • Los Angeles, Calif. • Belleville, Ontario



triple play for profit

with P&H ELECTRIC SHOVELS

All three of these P&H Electric Shovels are at work for J. Robert Bazely at Pottsville, Pa. There are three sizes at work here — 4, 5 and 6 cu. yds., all delivering steadily at rock bottom costs.

P&H leads the field in Electric Shovel Developments.

It's the same pattern wherever these new P&H Electric Shovels go to work: The first machine sells the second — the third — and more.

The reasons are plain and simple — *better performance — bigger production — lower tonnage cost.*

Reasons behind the reasons are such advantages as P&H Magnetorque* which powers hoisting motions electro-magnetically — smoother, faster, more dependably . . . rugged all-welded construction with more strength to withstand shock loads . . . independent propel for quicker move-ups . . . stepless control which eliminates all contactor troubles . . . filtered air cab ventilation for less electrical down time.

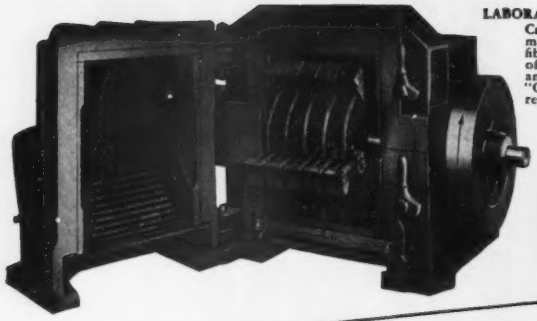
The cold, hard facts that count are: *performance, production, low tonnage cost.* Figure your costs with P&H Electric Shovels and you'll find a convincing difference. It explains why every third P&H Electric Shovel sold is a repeat order.

*T. M. of Harnischfeger Corporation for electro-magnetic type clutch.

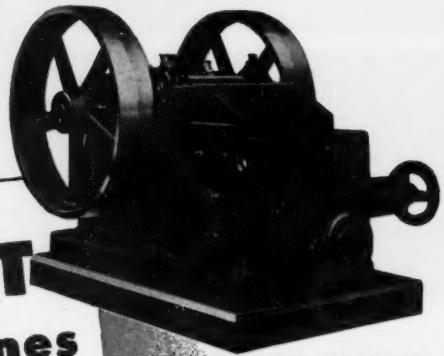
P&H ELECTRIC SHOVELS
4454 West National Avenue
Milwaukee 14, Wisconsin
HARNISCHFEGER CORPORATION

Every third P&H Electric Shovel sold is a repeat order

EXCAVATORS • OVERHEAD CRANES • HOISTS • ARC WELDERS AND ELECTRODES • SOIL STABILIZERS • CRAWLER AND TRUCK CRANES • DIESEL ENGINES • PRE-ASSEMBLED HOMES

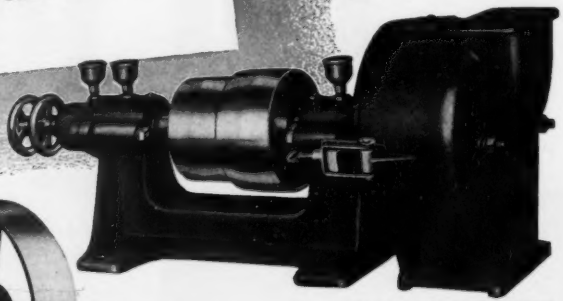


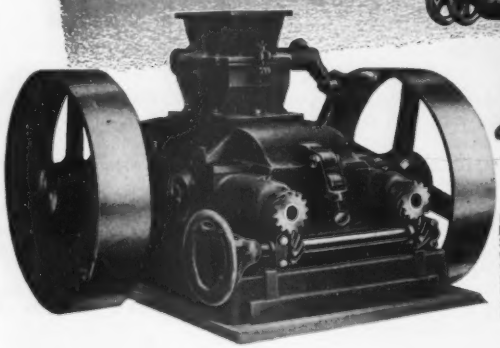
LABORATORY SWING-SLEDGE MILLS
Capable of reducing soft, moderately hard and tough or fibrous materials to any degree of fineness between 1 in. and 20 mesh. The patented "Open-Door" feature permits ready accessibility for cleaning.



STURTEVANT
Laboratory Machines
Assure Quality of Products
Fast - Economical - Accurate

LABORATORY JAW CRUSHERS
Special Roll Jaw action simplifies close regulation of the product with capacities varying from 300 or 400 lbs. per hour at finest settings, to 1000 or 2000 lbs. when opened for coarser work. Each part of the crusher is accessible for quick and easy cleaning.





LABORATORY CRUSHING ROLLS
First designed especially for laboratory sampling work, Sturtevant Crushing Rolls are used regularly in many plants where there are limited outputs. Range of output for the 8 x 5 size is from ½ in. to 20 mesh — and for the 12 x 12 size from ¾ in. to 20 mesh.

LABORATORY SAMPLE GRINDER
Laboratory Sample Grinders are of the "Open-Door" disc type and are capable of very fine work, producing products as fine as 100 mesh (coarser if desired) when working on dry, friable, soft or moderately hard materials. Simply turn hand wheel to provide product regulation from 10 to 100 mesh.

The only sure way to maintain strict quality of products is laboratory control . . . and that calls for accurate sampling.

Sturtevant Laboratory Equipment meets the exacting requirements of laboratory work. They are fast and accurate . . . provide true samples.

Rugged and dependable, Sturtevant equipment actually has all the features of full size machines plus extra accuracy and wider range of adjustment. The "Open-Door" accessibility permits quick, thorough cleaning . . . prevents the possibility of previous batches from contaminating new samples.

Investigate Sturtevant equipment for your laboratory. It will cut your sampling costs . . . help maintain strict quality of products . . . increase sales. Write for complete details and catalog.

STURTEVANT MILL COMPANY
101 CLAYTON STREET, BOSTON 22, MASS.

Designers and Manufacturers of: CRUSHERS • GRINDERS • SEPARATORS • CONVEYORS • MECHANICAL DENS and EXCAVATORS • ELEVATORS •

NOW... SCREEN FINE, MOIST MATERIALS Without Blinding!

ALLIS-CHALMERS
THERMO-DECK Heating Unit

NO "TIME OUT" to clear fine or medium mesh screen cloth! You can screen fine, moist non-combustible materials *continuously* with new *Thermo-Deck* heating unit.

INCREASED CAPACITY! Heated screen cloth *remains* open, permitting more tonnage through the screen and better separation.

LOWER COSTS! Operating records show that heated screen cloth lasts up to three times as long when cloth does not have to be pounded free of blinding material. The *Thermo-Deck* heating unit can be easily applied in the field. Your nearby A-C representative can give you more details. Allis-Chalmers, Milwaukee 1, Wisconsin. A-3602

POWER ON — *Thermo-Deck* heating unit keeps screen cloth clear on screen handling pulverized limestone.

POWER OFF — Troublesome blinding results on same screen when *Thermo-Deck* heating unit is turned off.

Send for...

New *Thermo-Deck* Heating Unit in operation!

National Sand and Gravel and Crushed Stone Shows

Stevens Hotel, Chicago

February 11th through 20th

ALLIS-CHALMERS BOOTHS 77-82

Thermo-Deck is an Allis-Chalmers trademark.

ALLIS-CHALMERS

Sales Offices in Principal Cities in the U. S. A. Distributors Throughout the World.

Pulverator

Jaw Crushers

Gyratory Crushers

Grinding Mills

Vibrating Screens

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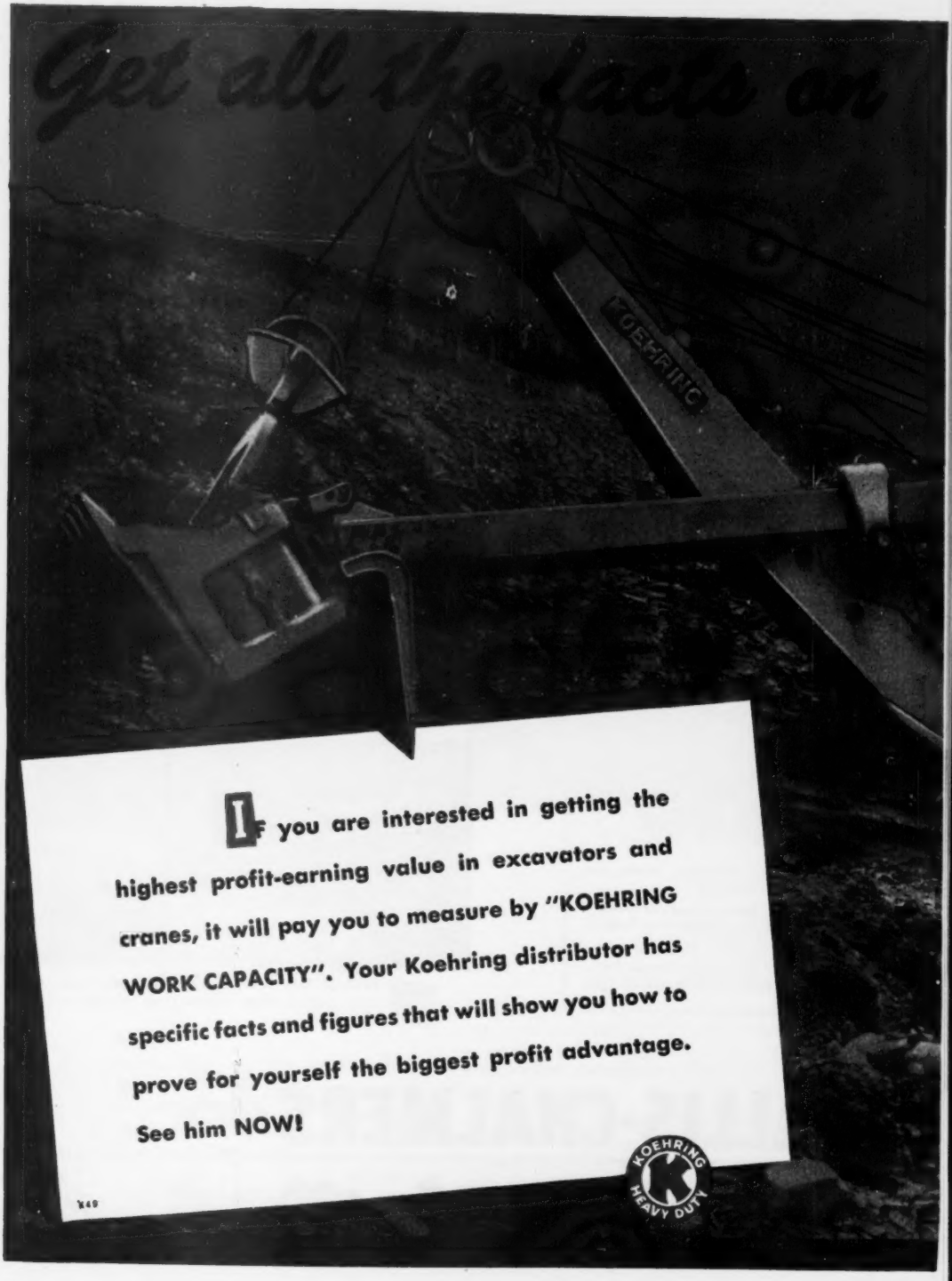
Get all the facts on
KOEHRING
IF you are interested in getting the highest profit-earning value in excavators and cranes, it will pay you to measure by "KOEHRING WORK CAPACITY". Your Koehring distributor has specific facts and figures that will show you how to prove for yourself the biggest profit advantage. See him NOW!
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HEAVY DUTY

"KOEHRING WORK CAPACITY"

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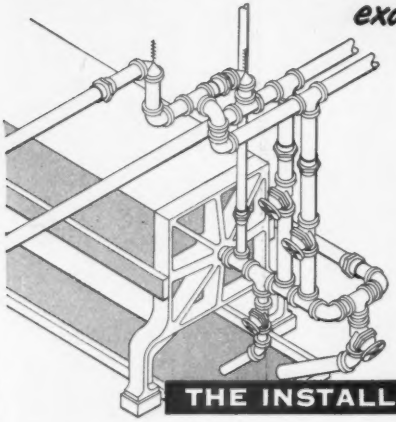
Do Your Valves Last This Long?

...on Semi-Solids, for example



THE INSTALLATION

Crane Packless Diaphragm Valves handling liquid clay to filter presses. Onondaga Pottery Co., Syracuse.

VALVE SERVICE RATINGS

SUITABILITY:	Fluid can't get into working parts
MAINTENANCE COST:	None yet – Big savings indicated
CORROSION-RESISTANCE:	Excellent
SERVICE LIFE:	5 times longer already – no sign of wear
OPERATING RESULTS:	No interruptions – Easier operation – Lower cost
PRICE:	Good
AVAILABILITY:	Stock item – Crane

THE HISTORY

Plug cocks were used in this service before replacing with Crane Diaphragm Valves. But the cocks lasted no more than 2 to 8 weeks. They quickly cut out at the plug and body, damaged by the gritty particles and highly erosive effects of liquid clay at 140 psi. pressure.

After 11 months' uninterrupted service, Crane Diaphragm Valves showed no significant wear or damage resulting from normal operating conditions. They sharply reduced maintenance and replacement costs over plug cocks, and were approved as standard equipment on filter press piping.

THE VALVE

In Crane Iron Body Packless Diaphragm Valves, the Neoprene diaphragm acts as bonnet seal only; is not subject to crushing and rapid wear. Separate disc with Neoprene insert shuts off flow even should diaphragm fail. Choice of fully Neoprene lined or unlined valves. Highly recommended for many common and corrosive services; sludges, slurries, etc. See your Crane Catalog or Crane Representative.

The Complete Crane Line Meets All Valve Needs. That's Why

More Crane Valves Are Used Than Any Other Make!

CRANE VALVES

CRANE CO., *General Offices:* 836 S. Michigan Ave., Chicago 5, Illinois

Branches and Wholesalers Serving All Industrial Areas

VALVES • FITTINGS • PIPE • PLUMBING • HEATING

Whether you want one worm-gear speed reducer or a thousand, a standard drive or a unit designed to meet your special problems, Cleveland is prepared to serve you. Meeting the most difficult requirements of machinery manufacturers and users is Cleveland's everyday business.

Just off press... FREE for your asking

YOU'LL find first aid in this new Cleveland catalog — whenever you have to select worm gearing or an efficient worm-gear speed reducer.

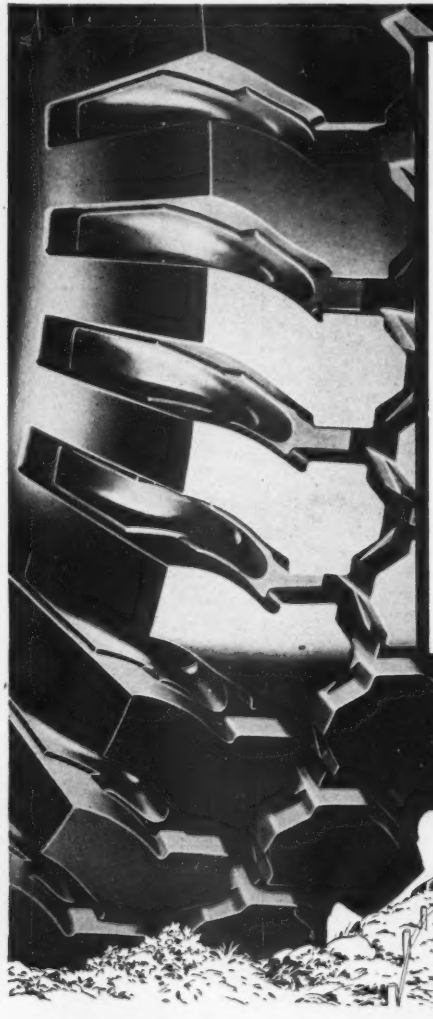
Catalog 400 replaces our old Catalog 200. Its 180 pages illustrate and describe each model in the complete line of Cleveland Worm Gear Speed Reducers. It contains engineering data on each type, including dimensions, weights and horsepower capacities—all the information you need to arrive at proper selections of drives for any equipment.

Over a year in the making, Catalog 400 is now available to all our customers. If you can use one in your work of designing power-driven equipment, or selecting speed reducers for new or old machines, just drop us a line on your letterhead.

The Cleveland Worm and Gear Co., 3281 East 80th Street, Cleveland 4, Ohio.

Affiliate: The Farval Corporation, Centralized Systems of Lubrication. In Canada: Peacock Brothers Limited.

U.S. ROYAL
FLEETMASTER Truck Tire



More mileage on the highway
More traction off the road!

Licks toughest on-off-road problems! Combines smooth, long-wearing roll on the highway with sure traction through mud, sand, rocks. Actually saves up to 70% of your tire costs! Remember the name—U. S. Royal Fleetmaster—tire specialist for truck-work on and off the road!

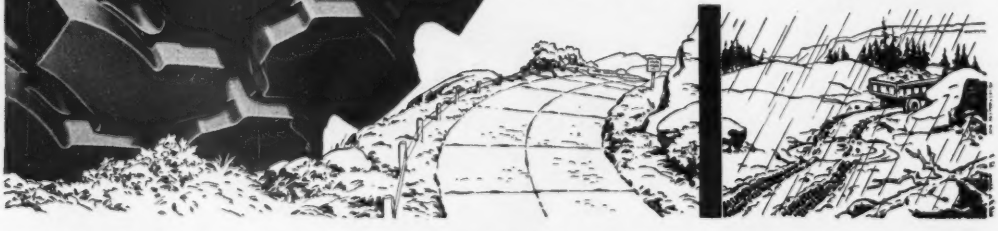
These facts can save you money!

- Longer wear—70% deeper traction tread!
- More safe mileage—more rubber on the ground!
- Less surface-shock—thicker undertread!
- More cut-resistance—job-fitted tread compounds!
- More recaps—tougher, round-molded carcass!

SEE AND COMPARE the Fleetmaster at your U.S. Royal Dealer's. Phone him today—he's in the Classified Telephone Book.

ONE TIRE DOES TWO JOBS!

ON THE ROAD **OFF THE ROAD**



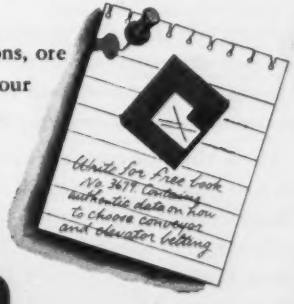
UNITED STATES RUBBER COMPANY

Belting
built to do ~~the~~ *your* job!

THERMOID custom-built conveyor belts promote profitable operation

Toughness measured by long years of industry-wide approval is your basic assurance of satisfaction with Thermoid Conveyor Belting. Its record of endurance is documented by results that mean greater profits. And equally important — Thermoid advanced engineering adapts this rugged product to your specified belting requirements, assuring an installation that will do the job . . . YOUR job!

Whether your need is conveyor belting for mining operations, ore concentrating, smelting, refining or dredging — call your Thermoid distributor. If you have a special problem a Thermoid Field Representative is always available to help you select the right belt for YOUR job.



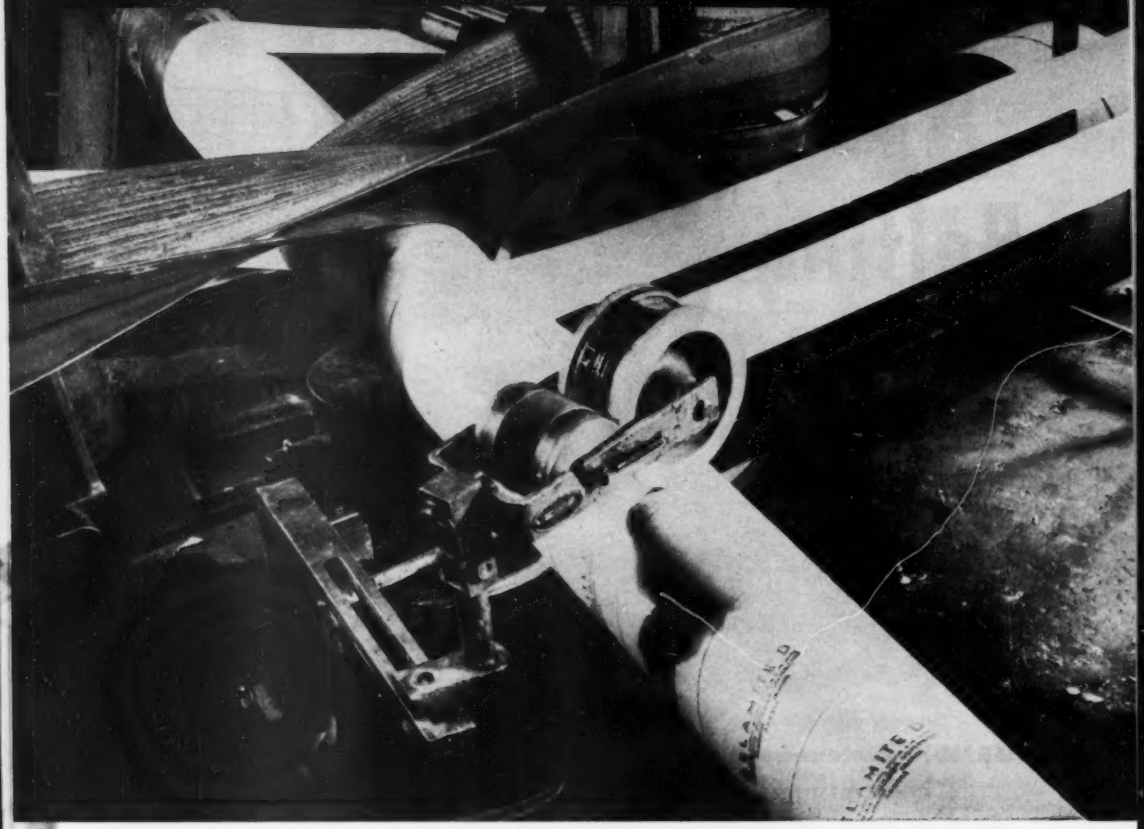
Conveyor & Elevator Belting • Transmission Belting
F.H.P. & Multiple V-Belts • Wrapped & Molded Hose

Thermoid

Rubber Sheet Packing • Molded Products
Industrial Brake Linings and Friction Materials

Thermoid Company Offices & Factories: Trenton, N. J., Nephi, Utah

PROGRESS IN EXPLOSIVES . . .



DYNAMITE, KING-SIZE

Did you know that dynamite comes in cartridges this big? Hercules pioneered in developing these larger cartridges which make for efficient blasting in large-scale coal stripping, open-pit mining, and quarrying operations.

These king-size cartridges range in diameter from 1¼ in. to 11 in. and weigh as much as 60 lbs. when filled. Spiral-wrapped in Hercules' own plants, they offer advantages in rigidity and smoothness. Other advantages: They are essentially their own shipping containers, are easier to handle and use, and can be stacked like cordwood.

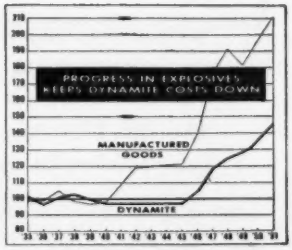


Chart shows relative stability of dynamite prices since 1935, as compared with prices of other manufactured goods. 1935-39 values=100.

HERCULES POWDER COMPANY

INCORPORATED

Explosives Department, 933 King St., Wilmington 99, Del.

XR52-3

NOTES FROM THE PUMP ENGINEER'S HANDBOOK

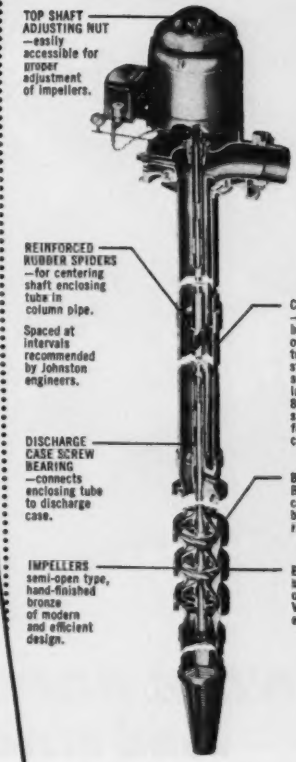
Little Details Like the XXX Seal Make Johnston Pumps Better!

Johnston pump bowl assemblies fitted with enclosed impellers have the Johnston XXX Seal—just another small detail that makes each Johnston the pump with real inside qualities. The design of the Johnston Seal, formed by the impeller shroud and the wear ring, provides sealing surfaces which prevent *any loss of efficiency* caused by liquid by-passing.

The extra hardness of the renewable aluminum bronze wear ring over standard bronze construction gives added protection, longer life and higher *sustained* pump efficiency. This is just one of the many little inside quality features that make each Johnston Pump better.

Every Johnston Pump is engineered for the specific duty for which it is intended. Trained hydraulic engineers are available at your nearest Johnston Dealer or at the Johnston factory to furnish detailed information, proposals and anything else necessary to meet your particular pumping equipment needs. Compare the inside qualities of Johnston Pumps and you'll never buy any other!!!

Sizes from 4 to 32 inches; single- or multi-stage; 2 to 1000 H.P.; capacities to 10,000 G.P.M.; lifts to 1000 feet; for liquid temperatures to 400°F.

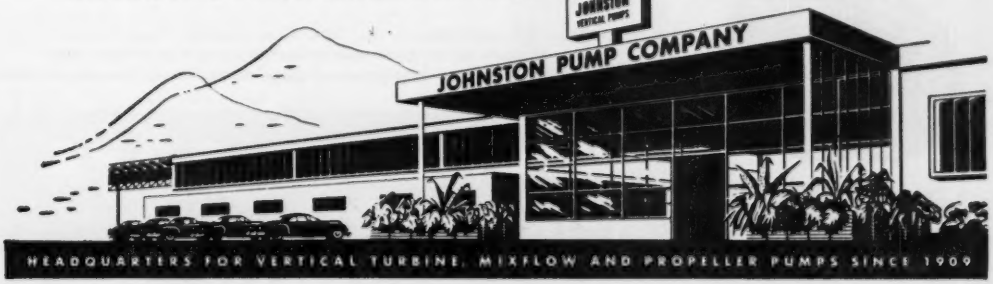

TOP SHAFT ADJUSTING NUT —easily accessible for proper adjustment of impellers.
REINFORCED RUBBER SPIDERS —for centering shaft enclosing tube in column pipe.
Spaced at intervals recommended by Johnston engineers.
DISCHARGE CASE SCREW BEARING —connects enclosing tube to discharge case.
IMPELLERS semi-open type, hand-finished bronze of modern and efficient design.
COLUMN PIPE —non-slag bearing steel of high tensile strength supplied with lathe cut, 8-pitch, straight threads for butt-joint connections.
BOWL BEARINGS— combination bronze and rubber.
BOWLS— supplied with or without Vitriform enameling.

Johnston Turbine Pumps are made for a wide variety of uses in the mining industry. They are designed for primary water supply; for sump and booster pumping; for dewatering. They have literally hundreds of applications.

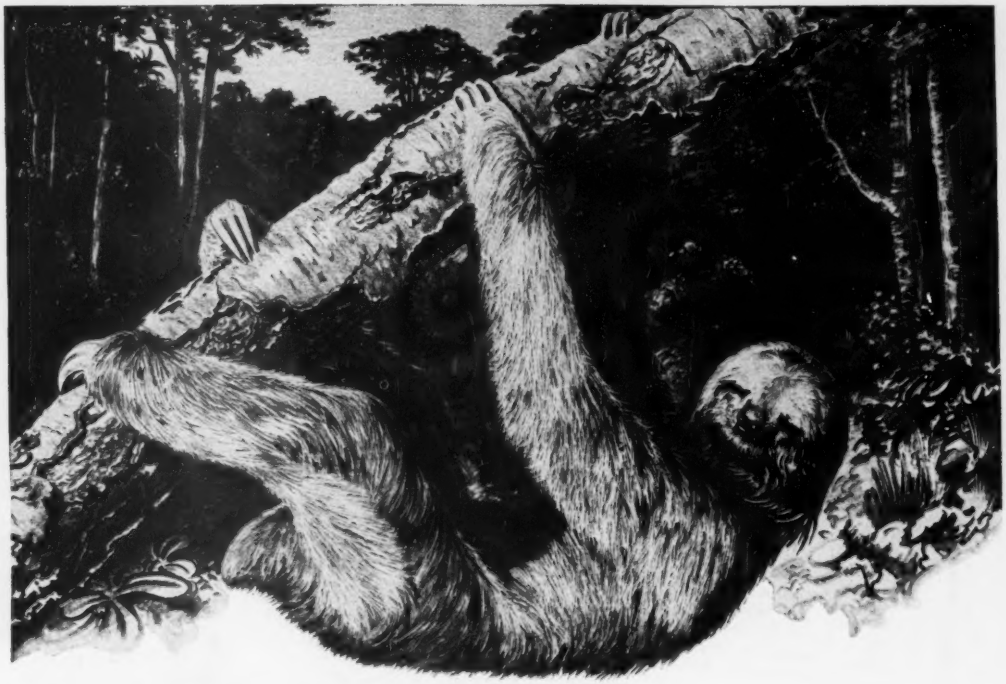
Due to the interchangeability of component parts, a Johnston is so flexible that the same unit may be adapted to many types of pumping operations. The selection of the correct pump for the job is dependant upon field conditions and the results required.

After a survey of your requirements, Johnston engineers recommend the type and size of turbine pump that's most economical and satisfactory for the job. It may be oil lubricated or water lubricated, with semi-open or closed type impellers. For corrosive liquids special materials are available . . . no matter what the conditions, the Johnston Turbine pump you buy is engineered to meet your needs.

JOHNSTON PUMP COMPANY
3272 EAST FOOTHILL BLVD., PASADENA 8, CALIFORNIA



HEADQUARTERS FOR VERTICAL TURBINE, MIXFLOW AND PROPELLER PUMPS SINCE 1909



in WIRE ROPE, too load strain calls for SPECIALIZED muscles

Everything looks upside down to the three-toed sloth. Unique among animals, he prefers to live his life dangling downward from the top branches of tall trees. Helping him to survive in his topsy-turvy world are highly specialized and powerfully developed rear and forelimb muscles.

In wire rope, too, specialized jobs call for the right kind of muscle. Load strain! Bending fatigue! Shock stress! Abrasion! Each calls for wire rope that best combines the required resistance characteristics.

Complete quality control from ore to finished rope; long experience and specialized know-how—these are your assurance that in Wickwire Rope you always get the proper combination of physical properties for long-lasting, reliable service on your particular job.

For additional information write or phone our nearest sales office.

THE COLORADO FUEL & IRON CORPORATION—Abilene (Tex.) • Denver • Houston • Odessa (Tex.) • Phoenix • Salt Lake City • Tulsa
THE CALIFORNIA WIRE CLOTH CORPORATION—Los Angeles • Oakland • Portland • San Francisco • Seattle • Spokane
WICKWIRE SPENCER STEEL DIVISION—Boston • Buffalo • Chattanooga • Chicago • Detroit • Emlenton (Pa.) • New York • Philadelphia

LOOK FOR
THE YELLOW TRIANGLE
ON THE REEL

WICKWIRE ROPE
CF&I
PRODUCT OF WICKWIRE SPENCER STEEL DIVISION
THE COLORADO FUEL AND IRON CORPORATION

Classification and Thickening: Cyclones are attracting wide interest in this field. Their use as primary thickeners in coal preparation plants is reported to require lower investment costs and less space over conventional thickeners. They are claimed to deslime effectively down to 10 microns, or to thicken with very dense spigot products. . . . . .

Excerpt from the article "Mineral Dressing" which appeared in the February, 1952 issue of Mining Congress Journal.

MILLING and ORE DRESSING MEN will be interested in H&P

CYCLONE THICKENER EQUIPMENT

. . . as THE ANSWER to Many of Their Classification & Thickening Problems

The Heyl & Patterson Cylone Thickener is a device utilizing Centrifugal Force to separate a suspension of solids in water into a thickened underflow and a low concentration overflow. The H&P Cyclone Thickener generates Centrifugal Forces up to 12,000 times gravity to separate the solids from the fluid.

Hundreds of Heyl & Patterson Cyclone Thickeners are now in use in the mining industry . . . controlling solids in Circulating Systems and separating solids from liquids.

The Cyclone equipment provides an economical and practical method of clearing up problems of:

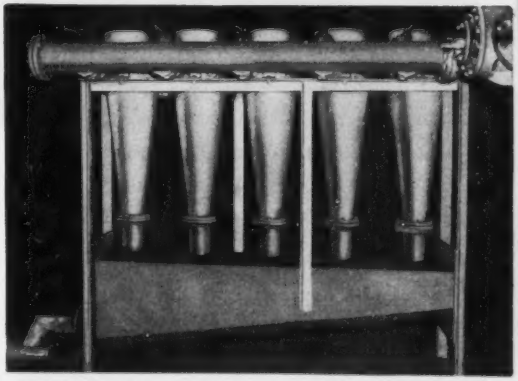
PULP Thickening . . .
PULP Classification . . .
PULP Concentration . . .
WATER Clarification

Heyl & Patterson laboratory and field tests have provided a sound basis for predicting accurately the Cyclone performance on most feeds. For further information ask for Booklet 5-CT-51 or send us your problem and we will tell you how a Cyclone application can provide the answer.

ADVANTAGES OF CYCLONE THICKENER EQUIPMENT

1. *Occupies a small amount of space.* 2. *Has a low initial cost (only a fraction of other thickening methods).* 3. *Needs a minimum amount of upkeep.* 4. *No moving parts.*

The standard 3" Cyclone Manifold consisting of a feed valve, combination feed chamber and overflow chamber, overflow valve, underflow pan and twenty-two Cyclones. The standard 3" Manifold consisting of twenty-two Cyclones has a capacity of 250 G.P.M. and is designed to operate at 40 PSI.



A typical manifold of five 14" Cyclones. These larger Cyclones are usually operated on lower pressure and are generally used as Classifiers.

Cyclone Thickeners
Thermal Dryers
{ The Drying Dutchman
{ Rotenyold Centrifugal Dryer
Thorsten Sampling Systems
Ore Bridges
{ Railroad Car Dumpers
{ High Lift-Turnover-Rotary
Rotary Mine Car Dumpers
Car Hauls and Boat Movers

Heyl & Patterson, Inc.
"SINCE 1887"
55 WATER STREET · PITTSBURGH 22, PA.

HEAVY BULK MATERIALS HANDLING EQUIPMENT

ALL THE WAY FROM DESIGN TO ERECTION

Gates V-Belts are chosen to keep HELICOPTERS aloft!

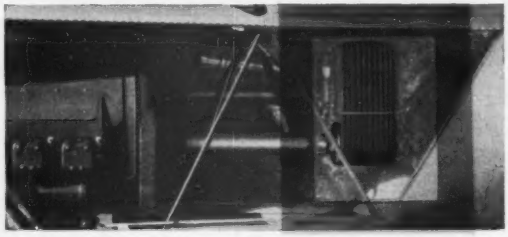
McCulloch Tandem-Rotor Helicopter

(Above) Two-place helicopter employs tandem-mounted, intermeshing rotors—a total of six rotor blades—powered by a 200-hp, six-cyl., aircooled horizontal engine installed at the rear. (Lower left) Gates-engineered V-BELTS, shown to rear of the engine, transmit power from the engine to the main drive shaft which in turn drives the reduction gearing for the rotors.

Because a helicopter is air-borne entirely by the turning of its rotors, McCulloch Engineers who designed this helicopter and supply it to the Navy had to be sure that the drive to the rotors was, above all, safe and reliable—a drive that would not fail when the helicopter was in the air.

The special difficulty in designing this drive was the extreme *compactness* required.

On small diameter pulleys and short center distances, the drive must handle 200 horsepower for 1000 hours at cruising speed and 500 hours at high speed. Ordinarily, it would have been impossible to achieve these results.



A Notable Application of Gates SPECIALIZED Research

However, Gates had developed a V-Belt which in thousands of applications had proved to have the exact characteristics required for this helicopter drive—and Gates had also developed design data which showed at once the applicability of this belt.

It was not by accident, therefore, that Gates Engineers were at once prepared to supply a V-Belt capable of handling this most exacting assignment and —in close co-operation with McCulloch Engineers—they developed the drive shown which has most successfully met all requirements.

Gates readiness to meet successfully *any* V-Belt Drive assignment is possible because Gates runs an *average* of 32,000 hours of testing *every week* on V-Belts alone! (32,000 hours is equivalent to *five years* of life for one belt.)

And the real value to you of such exhaustive testing is this: Laboratory findings are carefully checked by tests made under actual field conditions and the *results* are at once reduced to *usable data* for the design of V-Belt Drives to *perform whatever task may be required!*

Phone for a Gates Field Engineer

If you have a difficult drive to design, or if some drive in your plant is giving trouble, or if you only want to be sure what size and construction of V-Belts will give the most efficient and the lowest cost service on any particular drive—you have only to phone a Gates Field Engineer, *always near you* in all industrial centers.

Just look in your phone book under "Gates Rubber." A Gates Field Engineer will come right to your plant and put at your service the full benefits of Gates V-Belt knowledge and experience *without the slightest obligation!*

ENG-522

Gates VULCO ROPE DRIVES

Engineering Offices and Jobber Stocks IN ALL INDUSTRIAL CENTERS of the U. S. and 71 Foreign Countries

THE GATES RUBBER COMPANY

DENVER, U. S. A.

The World's Largest Makers of V-Belts

TALC MINED IN NEW YORK IS GROUND SO FINE YOU CAN'T EVEN SEE IT

Aerial view shows the surface buildings of the Gouverneur Talc Co. near Balmat, N. Y. The mine headframe is at the left; at the far right are the milling plant and silos for storing ore and ground talc.

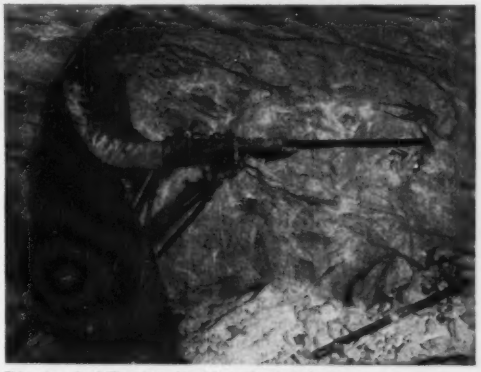
A talc particle of 0.8 micron diameter would have to be enlarged 55 times before it would be visible to the average eye! That's the kind of superfine talc they grind at the plant of Gouverneur Talc Company, Inc., near Balmat, N. Y., in the heart of the Empire State's talc-mining district.

Besides conventional grinding mills for talc of medium to large particle size, there are fluid-energy mills for the superfine sizes. The grinding energy is supplied by heated compressed air at high velocities which agitates the talc particles so furiously that they are broken down into the desired small sizes by being bombarded against each other at terrific speeds.

In operation since 1948, this producer, a subsidiary of R. T. Vanderbilt Co., of New York, has become a leading source of talc for use in paint, ceramics, cosmetics, paper, and many other products. Present output is about 200 tons daily. Using a modified room-and-pillar method, rooms are mined out from the dipping veins so that enough ore is left to serve as pillars for supporting the roof. The mine workings include a 600-ft vertical shaft, lined with concrete and having three compartments. Main operating levels are at depths of 300 and 500 ft.

Both jackhammer and stoper drills are used in production and development work, holes being bored 6 to 8 ft deep. Like so many mining men, they rely principally on Bethlehem Hollow Drill Steel. About 1200 ft per day is drilled, using both conventional detachable bits and carbide-tipped bits. Rods are reconditioned in the mine's own blacksmith shop.

A jackhammer breaks up large chunks of talc so that they will fall through the grizzly and into a loading pocket underneath. The hoist near the drill operator is used to scrape ore to the grizzly.



This miner is drilling into the talc orebody with a jackhammer supported by a "Jackleg." Using Bethlehem hollow drill steel and detachable bits, blast holes are put in 6 to 8 ft deep.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. Export Distributor: Bethlehem Steel Export Corporation

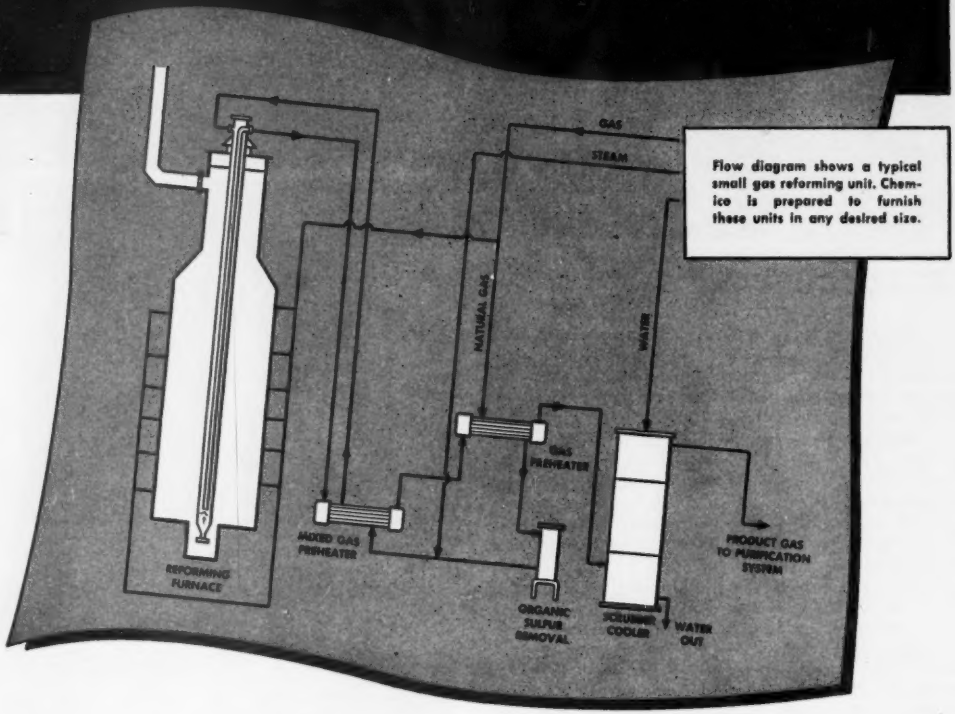
BETHLEHEM HOLLOW DRILL STEEL

BETHLEHEM STEEL

Produce Hydrogen

OR HYDROGEN MIXTURES

at Low Cost with a Chemico Plant



Flow diagram shows a typical small gas reforming unit. Chemico is prepared to furnish these units in any desired size.

Chemico offers units for the production of hydrogen mixtures by the catalytic reforming of hydrocarbon gases such as natural gas, propane and butane. For synthesis work, product gas can be limited to trace amounts of impurities. Other Chemico units may be used to produce controlled ratio mixtures of hydrogen with carbon monoxide, carbon dioxide or nitrogen.

Chemico has built these reforming plants in various sizes, ranging in capacity from 150,000 cfd. to 24,000,000 cfd. These plants are simple to operate, have virtually automatic centralized control, and are highly efficient.

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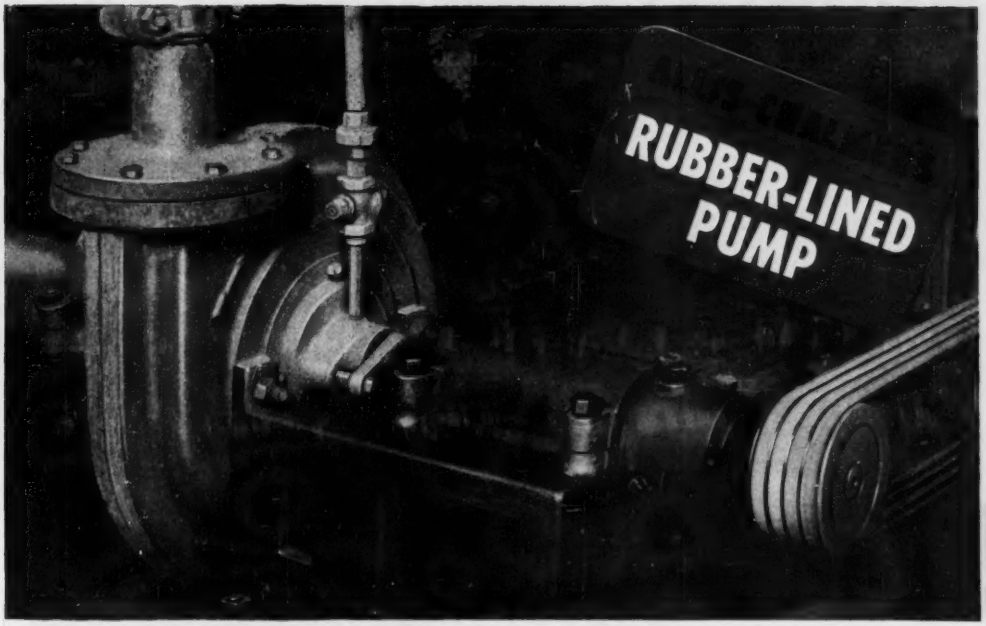
Chemico plants are profitable investments



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PERFORMANCE RECORDS FROM FIFTEEN YEARS of handling all types of slimes, slurries and other fine mesh abrasive suspensions show definite savings from the use of Allis-Chalmers type SRL Rubber-Lined Pumps. Instances of 10 to 50 times the life of the finest alloy pumps built for this service are not uncommon. Not only are pumping costs reduced, but production lost from shutdowns is almost eliminated and standbys often can be done away with.

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The rubber lining of the Allis-Chalmers SRL Pump is bonded to a heavy steel skeleton which is simply fitted into the casing. The lining and the casing are not bonded together. When the lining finally must be renewed, the pump need not be dismantled and removed from its location. Replacement cost is kept to a minimum.

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Every pump is individually engineered to provide the best possible performance for the application involved. Special rubber linings of various compounds are available to handle a variety of slurries at low per-gallon pumping cost.

If you are handling sand, taconite, grinding mill discharge, tailings or any other abrasive slime or slurry, ask your Allis-Chalmers representative to show you how you can get long pump life and low cost per gallon pumped. Or write Allis-Chalmers, Milwaukee 1, Wisconsin, and ask for Bulletin 08B7311. A-3698

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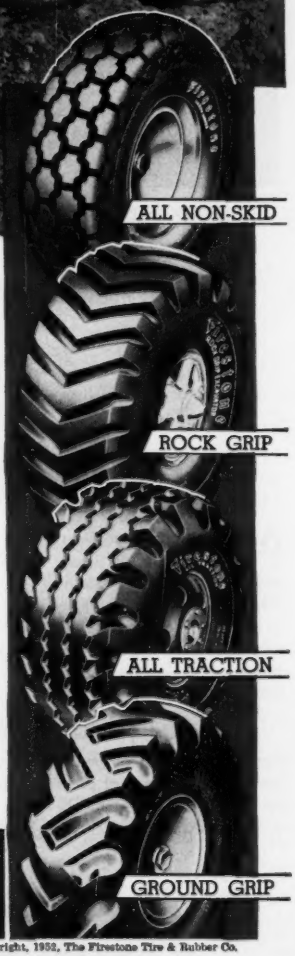
Let your Firestone Dealer give you complete information about Firestone Off-the-Highway Tires. Let him show you how to increase your yardage and profits.



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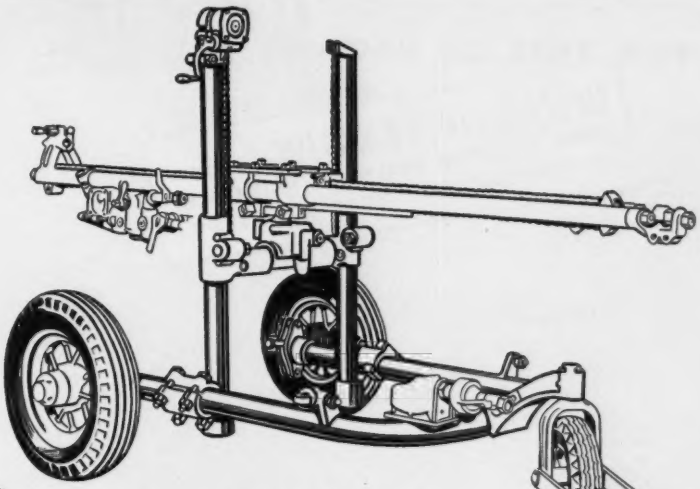

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G-300 Wagon Drill

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The tubular "H" structure that supports the drill carriage gives greater stability than the conventional design and minimizes vibration. The all-around sturdy construction of the G-300 maintains correct alignment at all times, insuring maximum drilling efficiency with minimum upkeep.

G-300 Wagon Drill

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- has controls conveniently centralized.
- is equipped with a specially designed feed motor and cone-gear drive for greater load-carrying capacity.
- has a heavy-duty centralizer.
- adaptable for all types of wagon drill work. Wheels can be turned at right angles to facilitate line drilling or drilling close to a ledge or wall.

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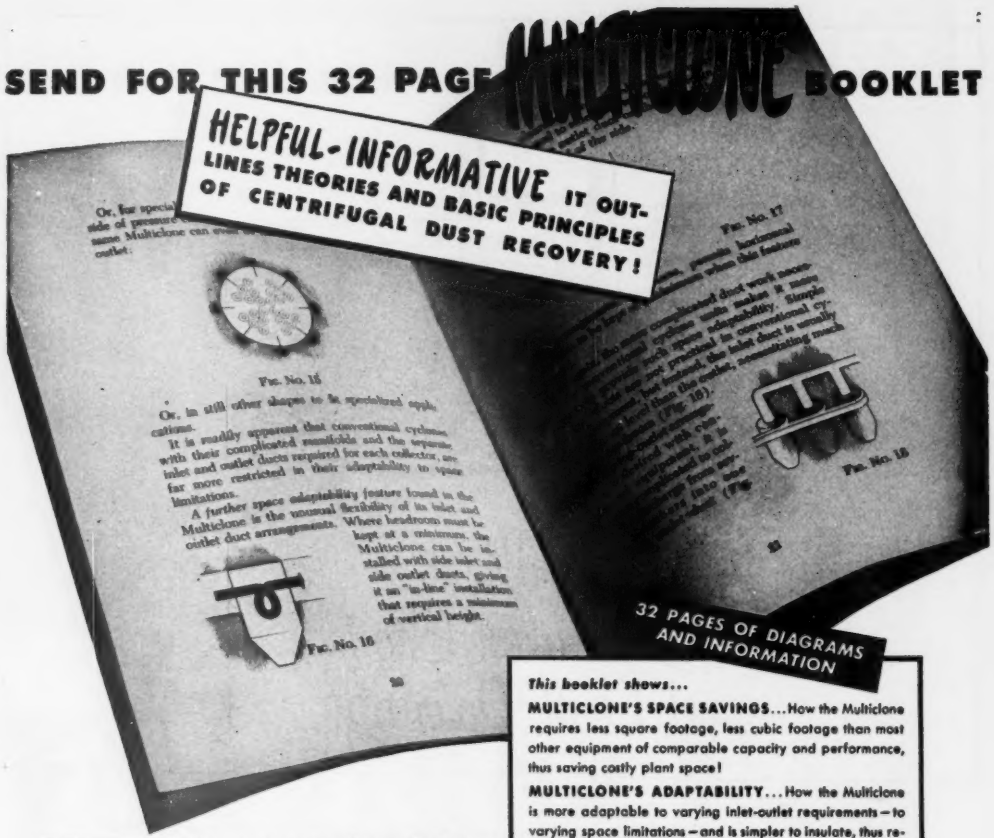
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Fig. No. 17
Fig. No. 18
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Missouri lead mine—about 1890. The work of raising the stem of this ancient drill for punch through rock was fatiguing for both man and beast. Prospecting like this was tough and costly.

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But some blasting techniques used today are as obsolete as this horse-operated prospecting drill!

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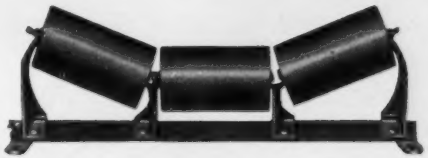
That's why Rex® Idlers are so often specified. Rex has been the leader in idler design and construction for over 25 years and sets the standard that others are working toward.

An idler must "keep rolling." If it freezes up, the belt will quickly wear through the roll, leaving sharp edges to cut your belt. The most common causes of idler "freeze-ups" are grit and dirt entering the bearings and build-up of material underneath the roll. To keep your Rex Idlers rolling, all you have to do is *keep your deck plates clean.* This will prevent material from building up on the rolls. The Rex Triple Labyrinth Grease Seal does the rest. The grease is there only to keep out dirt and grit, not to lubricate. With the special Rex seal design, the grease stays in . . . the dust stays out.

Remember, your idlers are the backbone of your entire belt conveyor. Don't gamble. Insist on Rex and be sure of a trouble-free performance year after year. For all the facts call your nearest Chain Belt Field Sales Engineer or write for Bulletin 51-81. Chain Belt Company, 4679 W. Greenfield Avenue, Milwaukee 1, Wisconsin.



For over 25 years Rex Idlers have been recognized as leaders in the field of idler design. Now Rex again leads the way with the flexible grease line. Note the accessible, protected location of the fitting. Extension of tubing to far side can easily be done in the field without special tools. Flexible sections hug the inside of the base.

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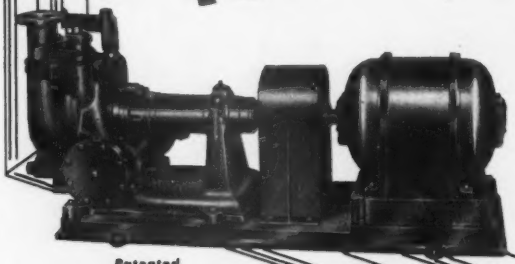
Handling rod mill discharge



Patented

The Model "K" WILFLEY is THE pump to buy when the job calls for a rugged, heavy-duty pump that delivers higher efficiencies, stepped-up production, worthwhile power savings and lower operating costs. Continuous, 24-hour-a-day performance. Easy interchangeability of wear parts. Low maintenance costs. Every application individually engineered. Write or wire for details

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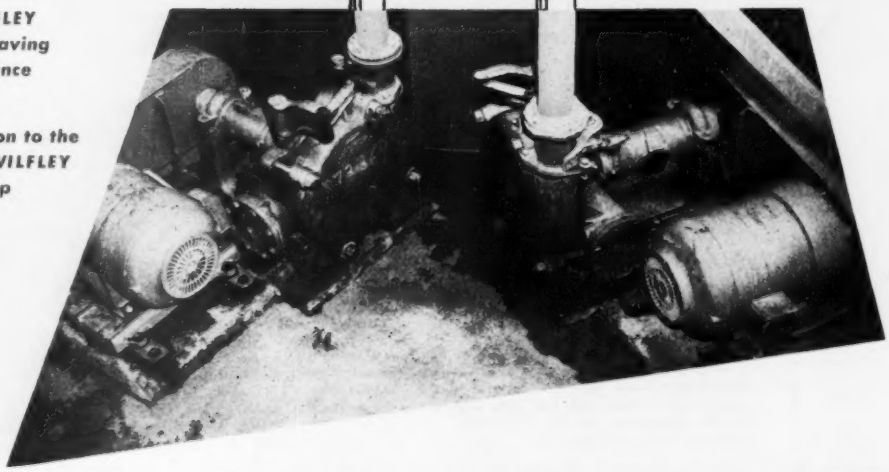
Companion to the famous WILFLEY Acid Pump



5" Model "K" Wilfley Sand Pumps in a large western sand and gravel plant handling 30% solid discharge containing highly abrasive 3/16" silica from rod mill.

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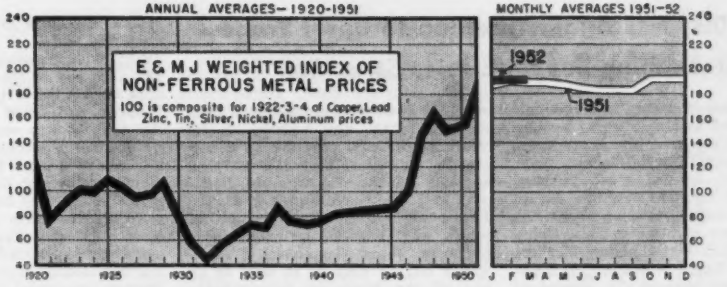
E&MJ OUTLOOK

PRICES



MARKETS

With tin holding at $1.21½ all month, the *E&MJ* index of nonferrous metal prices stood fast at 195.10, its highest point to date. There's talk that the price of copper ought to go higher, but politics, not economics, will probably call the turn on that one.

Outlook for metals is clouded by threats of strikes, easing markets abroad, commodity deflation at home, and uncertainty on future of stockpiling. All one can be sure of is that, barring extreme upsets of war or depression, metal sales will continue to be good all year.

■

LABOR

A compromise in steel looked like a bad bet as March ended, as the WSB's 19¢ increase and union shop suggestions fanned the flames.

However the steel issue comes out, Mine, Mill is going after a 25¢ increase from the Big Four copper companies. If union leaders act as tough as they talk, it means trouble, and renewed acute metal shortages.

■

AT HOME

Here are the alternatives on the outlook for general business at this point, more or less in order of probability (our guess).

1. Consumers will hang back on buying, hoping for lower prices; if a real sag in the economy develops, military spending will be stepped up.

2. Spring will thaw consumers' pocketbooks, wage increases will swell the tide, business will hold its own or pull ahead slightly.

3. New outbreaks of the shooting war will wreck present plans, cut civilian consumption, intensify shortages, addle everything.

With DPA's Sam Anderson calling for an aluminum stockpile of 4-million tons, stockpiling is a big issue again. More than 100,000 tons of lead, from foreign sources, slid into the U.S. stockpile in recent months. Will stockpile purchases take surplus domestic metal as well? They probably will, if stockpilers are given the money.

Sulphur is likely to run about 10% behind demand clear through 1956. But the AEC's tentative plans for acid consumption could upset schedules completely, if put into effect.

The National Lead-Allegheny-Ludlum titanium plant at Henderson, Nev. should be producing 10 tons of ingots daily by year's end.

Everybody's looking for new orebodies in the U.S. Nobody's having better luck than they are in the Metaline Falls area and on up to the northwest in British Columbia. Phenomenal discoveries, they say.

■

ABROAD

Labrador iron ore will start moving to steel mills by mid-1954, a year ahead of schedule. Time-saving construction methods are pushing up U.S. Steel's Venezuelan project, too.

Our favorite prognosticator on gold still sticks with his bet that the official price of gold will go up in April, 1953.

MARKETS—Trends and Prices

Wage Disputes Again Threaten to Upset Trade—Lead Stockpiling Supports Price Structure

THE OUTLOOK for nonferrous metals was obscured as March ended because of developments over which producers had no control. The deadlock in wage negotiations in the steel industry caused apprehension over the future of the entire stabilization program. At the same time, the International Union of Mine, Mill and Smelter Workers announced that it will drive for higher wages and support the demand of the steel workers. Copper workers at Anaconda's Chilean properties voted to strike April 6.

Whether politically-minded leaders will take prompt action to maintain production and prevent another round of wage increases could not be determined. Politicians usually pursue the easiest course. The latest demands of labor come at a time when deflationary forces have checked the upward trend in commodity prices.

To bolster the domestic economy, NPA officials announced that increased supplies of some of the "tight" strategic materials will be made available in the third and fourth quarters for civilian products. Automobile production and construction, chiefly housing, will fare better than earlier reports from official circles indicated. However, the bottleneck for most products will be copper, it is stoutly maintained. NPA officials continue to favor aluminum as a possible substitute. In fact, the supply outlook for the light metal is steadily improving and domestic producers are really concerned over proposed plans to further increase domestic capacity and at the same time extend the government's purchases of the metal in Canada. DPA was asked to take no action in closing a long-term deal with the Canadian producer without first bringing the matter to the attention of Congress.

Price Index Unchanged

Domestic quotations for nonferrous metals were unchanged throughout March, with the result that the *E&MJ* index of prices remained unchanged at 195.10, the high for the movement established in February following the rise in tin. During March, the RFC maintained its selling basis for tin at $1.21½. The government closed contracts with Indonesia and Belgian operators on the same terms as those announced earlier in the year under the British deal for Malayan tin.

The Federal Reserve Board's index of industrial activity has been remarkably steady. In the first quarter of 1952, it averaged close to 219% of the 1935-39 average. This compares with 218 in the fourth quarter of 1951 and 221 in the first quarter of last year. The defense program as it now stands is well within the physical capacity of the country, the Board observes, and should permit a continued high level of production of goods and services for nondefense purposes. What the course of consumer buying may be is held to be one of the important uncertainties for the immediate future.

Chilean Copper Dilemma

Except that Anaconda and Kennecott officials conferred in Washington on March 24 in regard to the demands for a new Chilean agreement, the situation underwent little change during the last month. Chile's objective appears to be to obtain all of the revenue that it can extract from the mines, and various feelers have been put out to suggest a possible solution. For one thing, the $1,200 per metric ton price asked on metal coming out of Chile's 20% take has not been moving. According to one estimate, fully 40,000 tons of premium copper have backed up on Chile. The price in Europe's outside market has dropped to around 40¢ per lb. on nearby copper, with far forward metal wholly nominal.

Restrictions on the sale and purchase of copper under the International Materials Conference's distribution plan have narrowed the market for premium-priced copper. The supply of copper available to the free nations in the second quarter of 1952 totals 723,680 tons, which compares with 744,680 tons in the first quarter. The moderate reduction in the estimated supply reflects a small drop in output that occurred in the Jan.-March period. The United States share of total allocations in the second quarter has been reduced to 355,600 tons, as against 366,000 in the first quarter.

Deliveries of refined copper to domestic fabricators totaled 235,225 tons in the first two months of 1952, as against 207,613 tons in the same period a year ago. Fabricators shipped products in the Jan.-Feb. period that contained 247,138 tons of copper. To maintain shipments the fabricators have been reducing their stocks, which dropped from 280,402 tons on hand at the beginning of the year to 258,279 tons on hand at the end of Feb.

Lead for Stockpile

The stockpile came to the rescue of the lead market. The U. K. sold some 23,000 tons of lead to the U.S. during March, making a total of 53,000 tons since the middle of February. In addition, it is reported that the stockpile absorbed substantial tonnages for delivery over the first half of 1952 from Mexican and other foreign sources. All told, it was estimated that the government's purchases for the stockpile removed more than 100,000 tons from the market, thereby stabilizing prices in an unsettled market.

During the week ended March 22, sales of Mexican lead by the American Smelting & Refining Co., including metal sold for consumption in Mexico, averaged 18.13¢ per lb., against 18.42¢ a month previous and 19.80¢ in the first week of the current year.

The New York quotation was maintained at 19¢ per lb. The f.a.s. Gulf quotation declined one-half cent to 18½¢.

Second quarter zinc "allocations" by IMC were raised to 510,145 tons, up 22,495 tons from the free nations' supply in the first quarter. World

Average Prices for March (E&MJ Quotations)

Copper:	
Electrolytic, domestic, refinery	24.200
Electrolytic, export, refinery	27.425
Lead:	
Common, New York	19.000
Common, St. Louis	18.800
Silver and Sterling Exchange:	
Silver, New York, per oz.	88.000
Silver, London, pence per oz.	77.000
Sterling Exchange, "Checks"	279.738
Zinc:	
Prime Western, East St. Louis	19.500
Tin:	
New York Straits	121.500
New York, 99% min. (e)	120.500
Gold, per oz. U.S. price	$35.000
Quicksilver, per flask	$207.000
Antimony (E&MJ) (d)	53.350
Antimony, bulk, Laredo	50.000
Antimony, in cases, Laredo	50.500
Platinum, refined, per oz.	$90.000
Cadmium (a)	255.000
Cadmium (b)	267.500
Cadmium (c)	280.000
Aluminum, 99% plus, ingot	19.000
Magnesium, ingot	24.500
Nickel (f)	56.500

Domestic quotations, unless otherwise stated, are in cents per pound. Sterling exchange checks, in cents. Quicksilver, per flask of 76 lb.
(a) Cadmium average based on the producers' quotation.
(b) Cadmium average based on the average of the producers' and platers' quotation.
(c) Cadmium average based on platers' quotation.
(d) Domestic, 5 tons or more but less than carload lot, packed in cases, f.o.b. New York.
(e) Tin content.
(f) F.o.b. Port Colborne, U.S. duty included.

production of zinc is increasing. The domestic quotation for Prime Western was firm at 19½¢, East St. Louis. In the foreign field there were larger offerings at around 21c., with business inactive.

Antimony was weak abroad, but unchanged here. Foreign metal was available at 44¢ per lb. Antimony ore quotations were wholly nominal. Tungsten ore was unsettled abroad and $60 per short ton unit of WO_3, f.o.b. foreign ports, could have been shaded on forward material. Manganese ore remained firm on record activity in the steel industry.

"Free" Gold Market

Continued unsettlement in foreign currencies was reflected in lower prices realized on gold in the "free gold" markets. The undertone was firmer as the month ended. Paris was the principal buyer.

Quotations for "free gold," per fine oz., according to Pick's World Currency Report:

	COINS		BARS (12.5 kg.)	
	Feb. 29	Mar. 31	Feb. 29	Mar. 31
NEW YORK, transit	.....	.....	$38.90	$38.25
MANILA	$49.50	$49.25	40.75	40.00
HONG KONG	49.00	48.75	42.25	41.25
BOMBAY	54.50	53.50	48.75	47.50
TANGIER	51.25	50.50	38.90	38.25
BEYROUTH	51.50	50.50	38.90	38.30
PARIS	53.50	54.00	40.75	40.75
BUENOS AIRES	54.50	52.00	42.75	41.75

(Markets continued on page 99)

Major Metals

U. S. DAILY AND AVERAGE PRICES

Mar. 1952	Electrolytic Copper (a) Domestic	(b) Export	Straits Tin New York	Lead New York	Lead St. Louis	Zinc East St. Louis
1	No Market	27.425	121.500	19.000	18.800	19.500
3	24.200	27.425	121.500	19.000	18.800	19.500
4	24.200	27.425	121.500	19.000	18.800	19.500
5	24.200	27.425	121.500	19.000	18.800	19.500
6	24.200	27.425	121.500	19.000	18.800	19.500
7	24.200	27.425	121.500	19.000	18.800	19.500
8	No Market	27.425	121.500	19.000	18.800	19.500
10	24.200	27.425	121.500	19.000	18.800	19.500
11	24.200	27.425	121.500	19.000	18.800	19.500
12	24.200	27.425	121.500	19.000	18.800	19.500
13	24.200	27.425	121.500	19.000	18.800	19.500
14	24.200	27.425	121.500	19.000	18.800	19.500
15	No Market	27.425	121.500	19.000	18.800	19.500
17	24.200	27.425	121.500	19.000	18.800	19.500
18	24.200	27.425	121.500	19.000	18.800	19.500
19	24.200	27.425	121.500	19.000	18.800	19.500
20	24.200	27.425	121.500	19.000	18.800	19.500
21	24.200	27.425	121.500	19.000	18.800	19.500
22	No Market	27.425	121.500	19.000	18.800	19.500
24	24.200	27.425	121.500	19.000	18.800	19.500
25	24.200	27.425	121.500	19.000	18.800	19.500
26	24.200	27.425	121.500	19.000	18.800	19.500
27	24.200	27.425	121.550	19.000	18.800	19.500
28	24.200	27.425	121.500	19.000	18.800	19.500
29	No Market	27.425	121.500	19.000	18.800	19.500
31	24.200	27.425	121.500	19.000	18.800	19.500
AVERAGES FOR MONTH						
Mar.	24.200	27.425	121.500	19.000	18.800	19.500
AVERAGES FOR WEEK						
Mar.						
5	24.200	27.425	121.500	19.000	18.800	19.500
12	24.200	27.425	121.500	19.000	18.800	19.500
19	24.200	27.425	121.500	19.000	18.800	19.500
26	24.200	27.425	121.500	19.000	18.800	19.500
CALENDAR WEEK AVERAGES						
Mar.						
1	24.200	27.425	121.500	19.000	18.800	19.500
8	24.200	27.425	121.500	19.000	18.800	19.500
15	24.200	27.425	121.500	19.000	18.800	19.500
22	24.200	27.425	121.500	19.000	18.800	19.500
29	24.200	27.425	121.500	19.000	18.800	19.500

Silver, Gold and Sterling

DAILY AND AVERAGE PRICES

March 1952	Sterling Exchange "Checks"	Silver (c) New York	Silver (c) London	Gold (d) London	Gold (d) United States
1	(e)	(e)	(e)	(e)	$35.00
3	278.250	88.000	77.000d.	248s.	35.00
4	278.125	88.000	77.000d.	248s.	35.00
5	278.000	88.000	77.000d.	248s.	35.00
6	278.000	88.000	77.000d.	248s.	35.00
7	278.000	88.000	77.000d.	248s.	35.00
8	(e)	(e)	(e)	(e)	35.00
10	278.000	88.000	77.000d.	248s.	35.00
11	278.125	88.000	77.000d.	248s.	35.00
12	278.750	88.000	77.000d.	248s.	35.00
13	280.500	88.000	77.000d.	248s.	35.00
14	280.500	88.000	77.000d.	248s.	35.00
15	(e)	(e)	(e)	(e)	35.00
17	280.500	88.000	77.000d.	248s.	35.00
18	280.500	88.000	77.000d.	248s.	35.00
19	280.500	88.000	77.000d.	248s.	35.00
20	280.750	88.000	77.000d.	248s.	35.00
21	280.500	88.000	77.000d.	248s.	35.00
22	(e)	(e)	(e)	(e)	35.00
24	281.000	88.000	77.000d.	248s.	35.00
25	280.875	88.000	77.000d.	248s.	35.00
26	280.625	88.000	77.000d.	248s.	35.00
27	281.000	88.000	77.000d.	248s.	35.00
28	281.000	88.000	77.000d.	248s.	35.00
29	(e)	(e)	(e)	(e)	35.00
31	281.000	88.000	77.000d.	248s.	35.00
AVERAGES FOR MONTH					
March	279.738	88.000	77.000d.	—	35.00
AVERAGES FOR WEEK					
March					
5	278.125	88.000	—	—	—
12	278.175	88.000	—	—	—
19	280.500	88.000	—	—	—
26	280.750	88.000	—	—	—

Calendar week averages, New York Silver: March 1st, 88.000; 8th 88.000; 15th, 88.000; 22nd, 88.000; 29th, 88.000.
(e) No market (Saturday).

THE above quotations for major non-ferrous metals are our appraisal of the important United States markets, based on sales reported by producers and agencies. They are reduced to the basis of cash, New York or St. Louis. All prices, except gold and silver, are in cents per pound.

(a) Net prices at refineries on Atlantic seaboard. To arrive at the delivered New England basis add 0.300c. per pound, the average differential for delivery charges.

(b) Our export quotation for copper reflects prices obtaining in the open market and is based on sales in the foreign market reduced to the f.o.b. refinery equivalent, Atlantic seaboard. On f.a.s. transactions we deduct 0.075c. for lighterage, etc., to arrive at the f.o.b. refinery quotation.

Copper, lead and zinc quotations are based on sales for both prompt and future deliveries; tin quotations are for prompt delivery only.

Quotations for copper are for the ordinary forms of wirebars and ingotbars; cathodes are sold at a discount of 0.125c. to 0.15c. per pound. Quotations for zinc are based on Prime Western brands. Zinc in New York commands a premium over the St. Louis basis equal to the freight differential. Contract prices for High Grade zinc delivered in the East and Middle West, effective Jan. 1, 1951, commanded a premium of 1.35c. per pound over the current market for Prime Western; Special High Grade 1.50c.

Quotations for lead are based on domestic common lead. Corroding lead commands a premium of 10 points.

(c) The daily New York silver quotation reported by Handy & Harman is for silver contained in ores and other unrefined silver-bearing materials, in cents and fractions of a cent per troy ounce. It is determined by Handy & Harman on the basis of actual sales of bar silver .999 fine in amounts of 50,000 ounces or more for nearby delivery at New York, as reported daily by regular suppliers, and is usually one-quarter cent below the price paid for such bar silver, this deduction being the allowance to such suppliers for carrying, delivering and marketing. In addition to foreign silver, the quotations also apply to domestic silver if such silver enters into the New York market.

The Treasury's purchase price of newly mined domestic silver is 90.5c. per troy ounce 1000 fine, effective July 1, 1946. London silver is pence per troy ounce, basis .999 fine.

(d) U.S. Treasury's gold price. Actual payment by the United States Treasury for gold is at 99.75 per cent of the price quoted by the Treasury, which is equal to $34.9125.

E&MJ HIGHLIGHTS

Taking a springtime look at this April issue, you'll see:

- **On the cover,** a squeeze fork-lift truck handling a bundle of stulls almost as dexterously as Superman would. Truck and bundle illustrate part of the work Ralph Neyman and associates are doing to cut labor costs—now 70.5% of total mining cost at the Star mine. See page 73.
- **For a good insight** into the problems of designing and building a custom sampler, **read** G. R. Kennedy's article on page 86.
- **Steep Rock's** reserves, potential and future are candidly discussed by M. S. Fotheringham on page 82.

Butte, Mont. has a big future in copper, zinc, manganese:

- **Following are a few highlighted quotes** from a talk given on March 18 by E. S. McGlone, Anaconda's vice president in charge of western operations.
- **Greater Butte.** "The Kelley mine . . . is producing ore at the rate of 2,000 tons a day and will increase to 5,000 tons by May, and within a year to 9,000 tons, and in five years to 15,000 tons a day."
- **More Copper.** ". . . our original reserve ecstimates were conservative. Already several million tons have been added, and in one area it is not unlikely that future exploration work will add another 100-million tons to the original figure of 150-million tons. **This could . . . result in an entirely new project** which could be mined concurrently with Greater Butte Project ores."
- **More Zinc.** "Zinc ore developments are equally encouraging . . . It is now safe to say that within five years zinc production . . . can be more than doubled."
- **More Manganese.** "The old Black Rock and Elm Orlu areas are being explored for manganese and zinc, and to date sizeable reserves have been disclosed, which, within the next five years, should produce through the Badger mine shaft as much as 3,000 tons of ore per day.
- **More Capacity.** ". . . we have already commenced to further modernize and enlarge our copper, zinc and manganese concentrating facilities at Anaconda . . . When this program is completed the Anaconda concentrator will have a capacity to treat 32,000 tons of ore a day."

Signs of the Times:

- **"Mexicans Believe U.S. Oil Men Bitter—**Companies Whose Wells Were Taken in 1938 Blamed for Lack of Capital Now." *Item headline, New York Times, 1952.*
- **"Mossadegh Scores Truman on Credit—**Says He Refused Help Unless Iran Settled Oil Dispute on Britain's Terms." *Item headline, New York Times, 1952.*
- **"Two U.S. Oil Concerns Sell Out to Peron—**Texas and Socony-Vacuum Tire of Argentine Curbs—Latter Quits Egypt." *Item Headline, New York Times, 1952.*
- **Way back about 550 B.C., Aesop the Slave said this:** "Thinking to get at once all the gold the Goose could give, he killed it only to find—nothing."
- **Popular today** are either of these methods for killing the Goose:
  1) **Expropriation.** Symptoms: Goose dies suddenly—no more eggs.
  2) **Restriction, regulation, and taxation.** Symptoms: Young goose matures slowly and, when mature, lays only a few eggs of miserably low gold content.

ENGINEERING AND MINING JOURNAL

APRIL, 1952

Don't Ignore The IMC

WITH THE SLACKENING in the recent almost hysterical demand for metals in all quarters of the globe, there is an even greater aura of unreality than ever over the "entitlements to consumption" that the International Materials Conference earnestly goes on issuing in Washington.

But although the IMC will soon have to face the fact that it has lost its last reason for existence, it can by no means be dismissed and forgotten. It will not die, because the forces that brought the IMC into being are still at work in the world, and will again make themselves felt.

To begin with, no discussion of the IMC can ignore the fact that the U.S. is at war. It is a war that is no less deadly and conclusive for having confined its shooting thus far to a very narrow segment of the globe. Maybe it can be held to those limits and fought and won without ever firing a shot outside Korea. Let's hope so. But let's not make the mistake of thinking that we are at peace.

Being in a war, then, we need friends. What more useful purpose among nations friendly to us could be served than to help strengthen their industries and their defense efforts, while strengthening our own, by giving access to raw materials on an equitable basis to all members of the group?

One further fact. The nations friendly to us became frightened in 1950, rightly or wrongly, that our overpowering financial position and our drive to pile up raw materials would combine to cut everyone else out of world metal markets until we chose to let them in.

The IMC was formed, by the State Department's invitation, to try, on a commodity-committee basis, to tailor consumption in the various countries more closely to available supplies.

Considered strictly on a war-time emergency basis, as we must now consider it, the idea isn't bad. Those countries most in need of raw materials to help defend the free world, get them. We get the raw materials we need, but we don't upset world markets and hamper our friends in the process. Only on this basis should we consider entering what is, after all, an inter-governmental cartel aimed at controlling world consumption and prices.

Having decided, because of an emergency situation, to set up an international raw material control system, we should obviously so organize and run it as to do the minimum of damage to raw material producers, both here and abroad. The producing industries, in other words, should have capable and continuous representation on the IMC.

The fact is that they do, from about every country except the United States. In looking over the directory of the IMC, one is struck at once by the close ties evident between industry and government in all the countries except the U.S. Now if our metals industry men had been invited to help organize the IMC, and had refused, there would be small cause for complaint. But as far as we can find out, the State Department made but little attempt to get as advisers on base metals, for example, men who have wide knowledge or experience in the industries whose products they were to allocate.

The result is that the U.S. is sorely handicapped in dealing with other nations, whose representatives speak for their industries first and their governments second. We are, in this and in many other ways, establishing an international reputation for an easygoing, soft-headed generosity that may turn suddenly into a tantrum of rage, as it did in the case of tin. Industry advice, if heeded, would have avoided so many foolish and costly mistakes.

Don't forget, too, that our State Department may regard, as it claims to do, the IMC as a temporary device which it is eager to abandon. The other nations, particularly the smaller nations, are eager, and sincerely eager, to maintain it. It is their chance to make their wishes mean something and they aren't going to give it up easily.

Therefore, unless we're vigilant, we may someday find our industry saddled with an international control agency in which it has almost no voice, but which effectively determines the distribution and price of its products.

No future emergency could justify action so drastic, and so foolish, yet it could happen. The mining industry, having had ample warning in recent months, should be on guard. And it should insist on taking a full and effective part in any future dealings of the sort that so deeply affect its destiny.

PACKAGING of round timber speeds handling. Here a package is waiting to be loaded on cage at shaft with 4,000-lb. squeeze fork-lift truck having 9-ft. lift. Another package of timbers awaits loading in lower left.

LAGGING ARRIVES BUNDLED for handling and is stored in concreted yard near collar of shaft. With fork-lift trucks of various capacities, unloading and stacking take only small fraction of time formerly required.

How improvements have boosted productivity as labor costs have risen

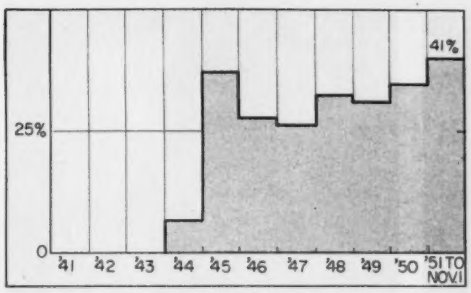


FIG. 1. TONS PER MAN-SHIFT in stopes and development were 41% higher Nov. 1 than at start.

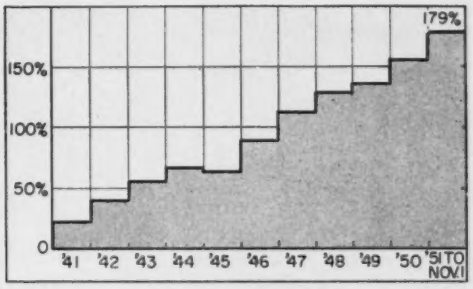


FIG. 2. LABOR COST has stood at higher level each year since 1940 until on Nov. 1, 1951 its total rise was 179%.

Lower Costs, Higher Efficiency Through Modern Equipment

Production per man-shift has been increased by wise spending for mechanical aids and improved methods

R. W. NEYMAN
General Manager
Hecla Mining Co., Wallace, Idaho

FOR SOME TIME the mining industry has been acutely aware of the rapid increase in the cost of labor and supplies. The major increase has been in labor cost although the appreciable rise in the cost of supplies must also be taken into account. Labor represents by far the greatest portion of the mining cost. At the Star mine production costs are at present split as follows: labor, 70.5%; equipment and supplies, 26.9%; and power, 2.6%.

From this it is apparent that additional expenditure of considerable sums for equipment supplies, and power, is justified to decrease the cost per unit or, stating it better, to increase the units per man-shift. This does not mean the elimination of labor. It means increased production per man-shift.

This is in line with what should be a nation-wide effort. It is only through increased production that we can hope to strengthen our economy and continue to raise our standard of living. In a broad sense every material thing we have is produced from natural resources. Only as these things are made available can mankind enjoy the benefits of them.

Since 1941 the Star mine at Burke, Idaho, has carried on an active program of mining improvements in an attempt to increase the unit output per man (see Fig. 1), as well as to keep abreast of the continually rising costs of labor and supplies that we have mentioned (see Fig. 2). Great difficulties were encountered for several years in putting these plans into effect. Since 1941 the shortage of men and materials caused by World War II and the events of the subsequent recovery period have retarded this development. Initiation of new projects, as well as the completion of some still pending, is held back by these causes. In spite of these and other obstacles, much has been accomplished toward offsetting increas-

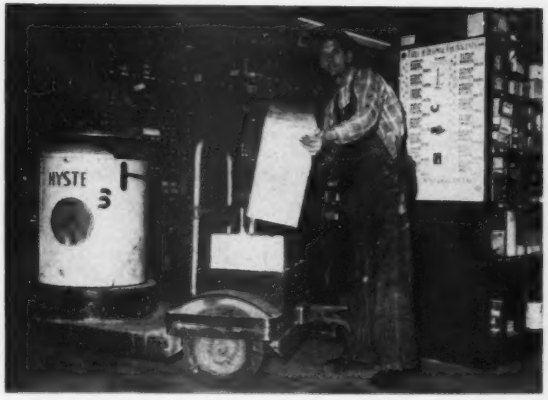
Table 1. Savings Made Through Expenditures at Star Mine and Time Required To Repay Investment

	Cost	Yearly Saving	Time Required to Repay Investment
Slushing in Stopes	(1)		
Bit and Rods	(2)	$19,600	
Compressed Air	$120,800	20,000	72½ months
Drills and Drill Repairs	(2)	28,600	
Main Line Ore Haulage	11,800	24,200	6 months
Materials Handling including Stull Handling, and Lagging Handling	96,400	22,700 78,300	11½ months
Pumping	50,800	34,000	18 months
Heating	17,100	10,800	19 months
	$296,900	$238,200	15 months

(1) Paid off before 1945
(2) Absorbed in operation costs

STRENGTH OF BUNDLE of lagging under rough use is shown by letting package drop while unloading it from cage to working level. Loading at collar was done by fork-lift truck, such as shown in top picture on page 72.

TEN-FOOT CHUTE TIMBERS, in package form, are removed from cage on 2,000 level with 4,000-lb., squeeze fork-lift truck. Labor thus released for other work is considerable.



WAREHOUSE can fill small orders rapidly with this gasoline "tug," supplementing deliveries of large orders by fork-lift trucks. Tug can tow 15,000-lb. load on dry level concrete. It will turn in its own length without tipping.

SUBSTITUTION OF BIT GRINDING for hot milling resulted in getting approximately one more usage per new bit with lower cost per foot drilled. Underground grinding plant is shown.

ed prices which cover such improvements as:

(1) Slushing in stopes;
(2) Bits and rods;
(3) Compressed air;
(4) Drills and drill repairs;
(5) Main line ore haulage;
(6) Material handling;
(7) Stull handling;
(8) Lagging handling;
(9) Pumping; and
(10) Heating.

What has all this cost, and has the saving effected actually justified these large expenditures?

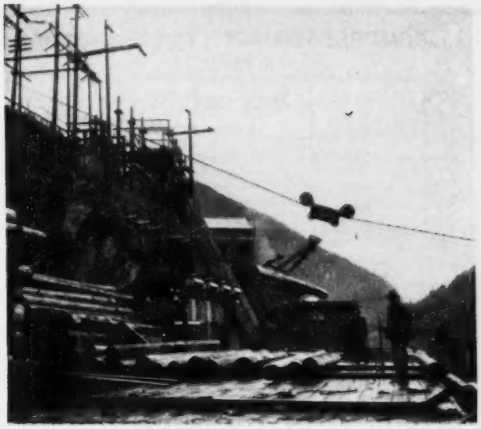
Table 1 gives a comparison of total expenditures with yearly savings effected and the length of time required to pay off the principal through present saving in labor and supply costs.

This clearly indicates the tremendous saving in costs made possible through expenditures properly spent toward improving methods and the purchase of modern equipment. It also indicates the manner in which the mining industry may increase unit production and in turn do its part toward improving the overall standard of living.

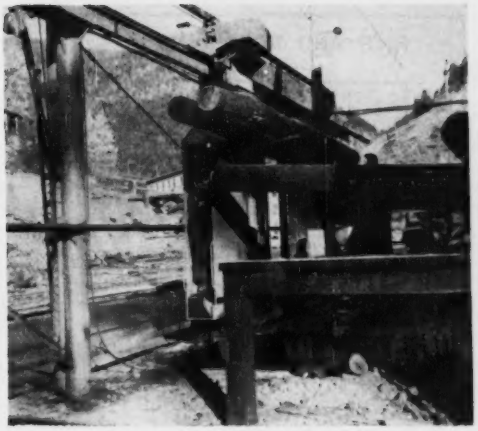
The various improvements made are as follows:

Slushing Speeds Extraction, Raises Output Per Man-Shift

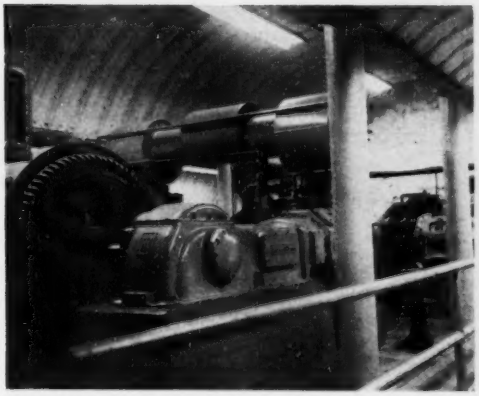
1. Scrapers Aid Cut-and-Fill Stoping. Prior to 1942 the common method for cut-and-fill stoping in the Star and Hecla mines consisted of shooting the muck from the stope round back onto the floor and then shoveling it through this floor into 22-cu. ft. stope cars on the floor below. The cars were then hand-trammed to the stope raise or ore chute from which the ore was drawn on the drift level. Waste for filling was brought in in the same way.



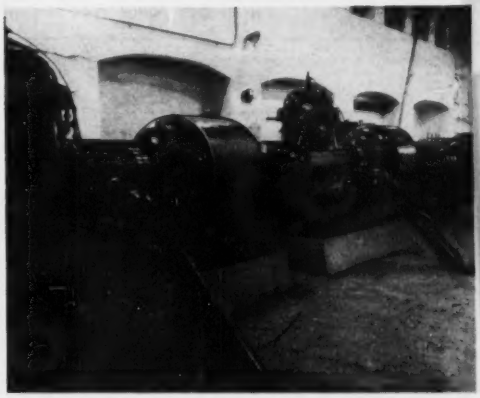
STULLS ARE UNLOADED from flat cars to pile by overhead high line traveling on parallel rails which traverses length of stull yard. Fork of special design handles one to six logs.



AN ALL-ELECTRIC OVERHEAD MONORAIL CRANE serves to transport stulls from skids into saw mill. Arrangement allows complete selectivity in placing logs for special orders.



AIR LOSSES HAVE BEEN CUT, working pressures maintained, and power saved by putting compressors underground and creating storage for 500,000 cfm at 110 psi in long dead-end crosscut.



PUMPING SYSTEM has been modernized with provision of fully automatic units of highest efficiency rating. Less than one man-shift per day is now required for the operation of these pumps.

Progress in the stope was slow and, to stabilize the bad walls better while taking a 9-ft. floor across from raise to raise, the track on the wheel floor was raised approximately 2 ft. on what were called track bents, so that the gob backfill would cover and give support to the caps and as much of the lower part of the stope walls as possible, while the next slice was being completed above.

Experiments were started in 1942 to determine the advisability of installing slushers to replace the hand-tramming and, if so, the proper method of operation. After preliminary trials, the advantages of slushers were so apparent that the whole mine was equipped with them as fast as they could be procured. The principal advantages were:

1. The rate of advance across the floor was increased until it became unnecessary to fill above the scraper floor caps for protection.

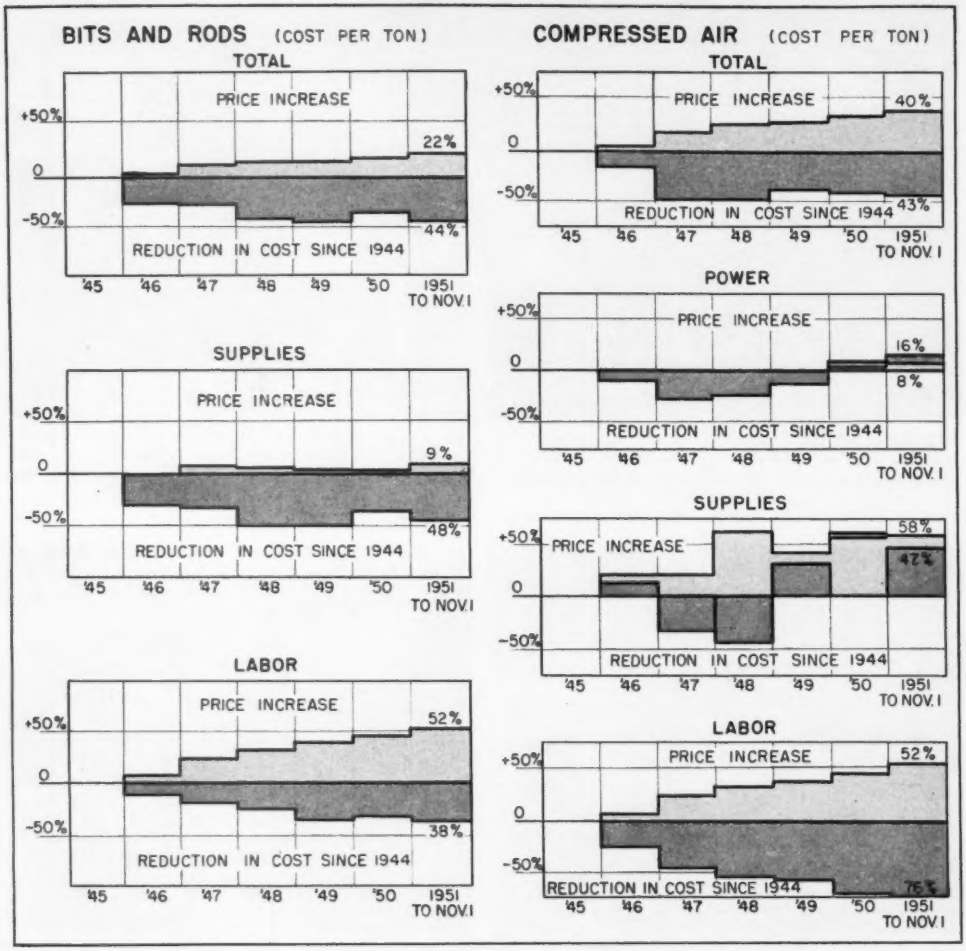
2. The ore was dropped out of the way at once so that timbering and drilling could proceed on the mining floor.

3. As a result, the output per man shift has been increased 41% at present. We can now carry 10-ft. stope-floor intervals instead of 9-ft. intervals as previously, because the mining rate is much faster. This also increases the tonnage per floor 11%.

Smaller Bits, Rods, Machines Permit New Savings

2. Bit Usages Raised by Grinding. Prior to 1945 the Star operations were carried on in conjunction with the Hecla operations, both using the same shaft, maintenance and surface crews,

COST of labor, supplies, power (where used), and total costs are given in each graph for stated operation in percentage of increase or decrease in respect to 1944 prices. Above zero line is given actual increase in unit



Costs of Labor and Material Included in Accompanying Graphs

Bits and Rods

Bit room maintenance . . . New bits used . . . Handling, sharpening and reconditioning of bits . . . New sharpening equipment including installation cost . . . Repair of sharpening equipment . . . New steel used . . . Cutting, threading, shanking, reconditioning, bit rods . . . New threading and rod repair equipment including installation cost . . . Repair of rod equipment . . . Oil for rod furnaces.

Drilling

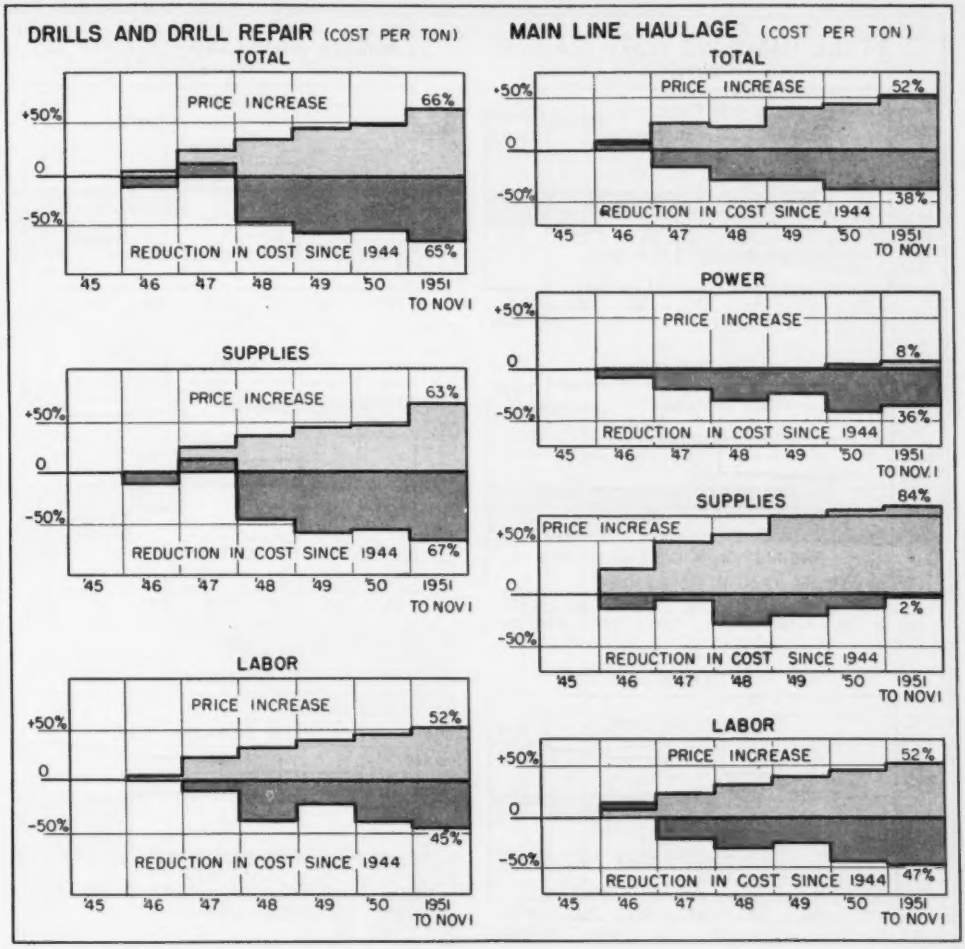
New drill machines . . . Repair drill machines . . . Oil for drill machines . . . New hose—air and water . . . Repair of hose—air

warehouse and office facilities. Bits for both mines were sent to a custom shop for hot-milling. Bits were dispensed on the surface for both mines and the unsatisfactory features of the men receiving their bits at this point and carrying them individually through the shaft and on the coaches were apparent to any observer.

Upon termination of Hecla operations in 1945 a bit grinding and dispensing plant was set up in the Star mine. Bits were reground instead of hot-milled as previously. It was immediately noted that approximately one more usage per new bit put into circuit was obtained by regrinding, with a corresponding decrease in cost per foot drilled.

It was also determined through extensive tests that the large $2\frac{1}{8}$-in. starter bits, required with the $1\frac{1}{4}$-in. round steel then used, drilled more slowly, caused more steel loss through breakage, consumed more air per foot of hole, could not be resharpened as quickly, and caused more wear on drills. As a result of these tests, all drills except $3\frac{1}{2}$-in. piston machines used on contracts were then equipped with 1-in. hexagon chucks, and the Sibley-type bits were re-

cost of all commodities involved in calculation. Below zero line is given percentage saving in per-ton cost that would have been effected, had labor costs remained the same as the 1944 base used.



and water . . . New machine bars—arms—clamps . . . Repair of machine bars—arms—clamps.

Compressed Air

Compressor rooms maintenance . . . New compressors—including installation cost . . . Repair of compressor equipment . . . Operation of compressors—Power—Oil . . . All pipe and pipe fittings 2 in. and larger . . . Air receivers . . . Installation and maintaining air lines.

Heating

Fuel—purchase cost of coal, including freight and unloading to bin . . . Maintenance of boiler room, including firemen . . . New boilers, including installation cost . . . Repair of boilers . . . New stoker equipment, including installation cost . . . Repair stoker equipment.

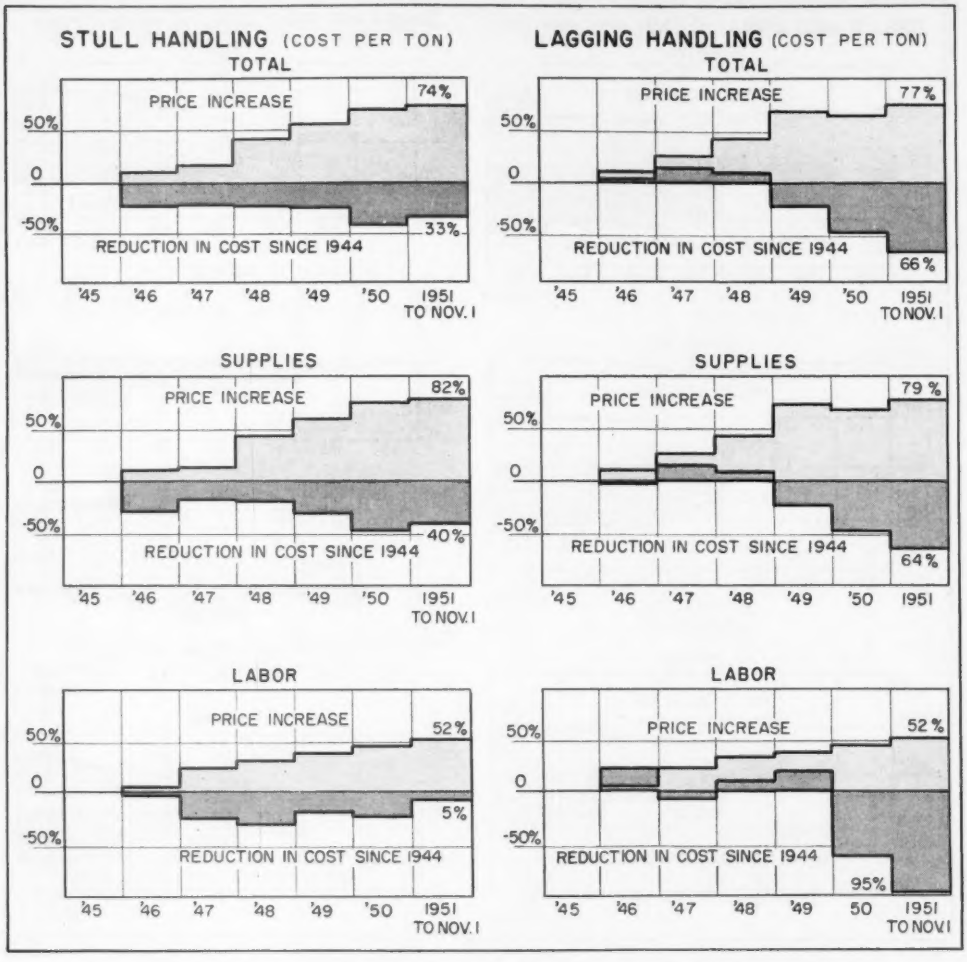
placed by type AO bits with 1⅞-in. starters. Uses per bit and drilling speed immediately increased, while grinding time, rod breakage, and drill-repair costs decreased. Since this change all 3½-in. machines on contract have also been replaced with 3-in. machines, thus making an additional saving in air consumption without observable loss in drilling speed.

Compressors, Storage for 500,000 cmf Underground

3. Air Losses Cut. When the Star mine was originally opened at depth, in preparation for mining through the Hecla shaft, compressed air was supplied from the Hecla surface plant through 11,000 ft. of 6-in. air line. As Star operations expanded, the increased air consumption caused a tremendous friction loss through this long supply line; the air pressure dropped as much as 45 lb. during peak consumption.

A 2,000-cfm compressor was installed underground in the Star mine to reduce the amount of flow and the attendant costly friction loss through this long pipe line. However, considerable drop in pressure was still suffered during peak usage, particularly between

COST of labor, supplies, power (where used), and total costs are given in each graph for stated operation in percentage of increase or decrease in respect to 1944 prices. Above zero line is given actual increase in unit



Costs of Labor and Material Included in Accompanying Graphs

Stulls to Mine

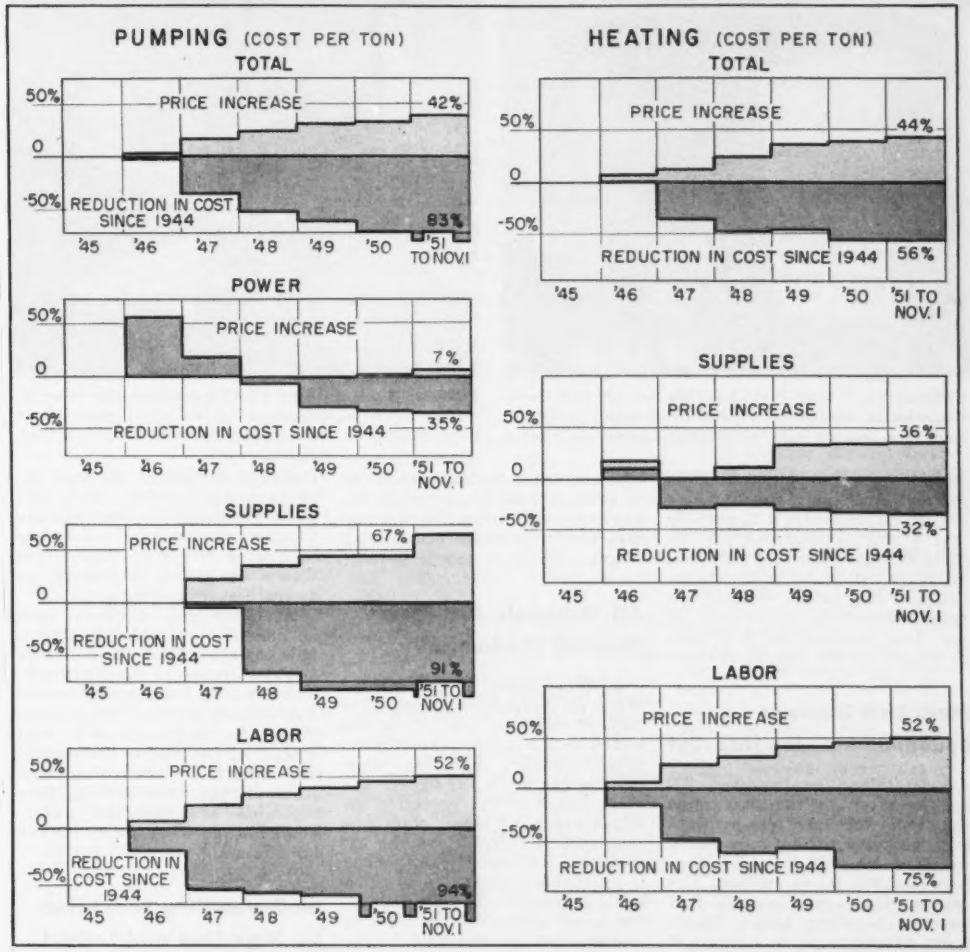
Stulls—Purchase cost of stulls including freight and unloading expense to stull pile . . . Maintenance of sawmill including sawmill workers . . . New sawmill equipment including installation cost . . . Transportation of stulls from pile to mill and from sawmill to shaft collar . . . Wedges — Including cost and repair of wedge-making equipment. . . . New saw . . . Repairing and filing saws . . . Sawdust disposal expense . . . Plant provided for heating the sawmill.

the hours of 9 to 11 am and 12 noon to 1 pm.

The Star was fortunate in having a long dead-end crosscut on the 4,000 level in good rock which had a cross section of approximately 9x10 ft., 750 ft. of which could be utilized for an air receiver. This crosscut was bulkheaded with reinforced concrete, but a 4x6-ft. opening was left in it for the passage of equipment if found necessary in the future. This opening was covered by an all-weld steel ribbed door set on Neoprene gaskets. Pressure readings indicated a capacity of 500,000 cu. ft. of free air at 110 psi. However, a leakage loss was determined at 40 cfm, which was later partially corrected. An automatic valve protects the exhausting of any air below 90 psi in case of line breakage. The receiver is automatically drained of water.

The result of creating this storage for compressed air was to furnish constant working pressures at the working places, to allow a more constant rate of air compression and the saving of electric power through the more uniform operation of compressors and reduction of friction loss through the use of shorter supply lines. This in turn has increased slusher output and drilling speed with an attendant decrease in bit, rod and drill repair costs.

cost of all commodities involved in calculation. Below zero line is given percentage saving in per-ton cost that would have been effected, had labor costs remained the same as the 1944 base used.



Lagging to Mine

Lagging—Purchase cost of lagging, including freight, unloading and yard storage expense . . . Transportation of lagging from yard storage to collar of shaft . . . Cutting and bundling of headboards or any special size of lagging done at the mine plant . . . Nails used underground.

Pumping (Hecla Shaft)

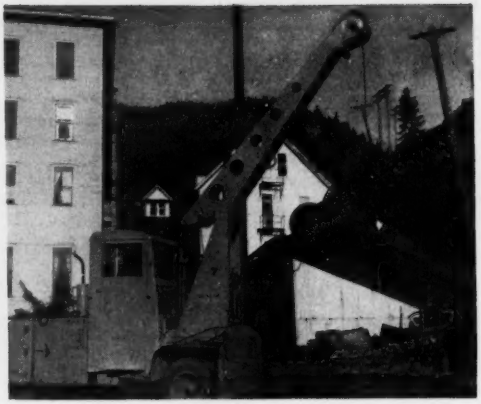
Maintenance of pump room in Hecla shaft including pumpman . . . New pumping equipment including installation cost—Hecla shaft. . .Repair of Hecla shaft pumping equipment . . . New pipe and fittings for Hecla shaft pump line . . . Maintaining sumps and pipe lines for Hecla shaft pumps . . . Power for operation of Hecla shaft pumps.

Drills Are Modernized—Scrapped When Repair Costs Mount

4. New Rock Drills Save Money. A study of drill costs made in 1946-1947 revealed that keeping old machines in repair had several disadvantages. First, old-type drills were not as efficient as the new, lighter machines which drilled faster. Second, new machines could be equipped with automatic feeds, New York backheads, steel centralizers and large water tubes, all of which resulted in more feet of hole per minute and less dust exposure for the operator.

As a result of this study, the mine was equipped throughout with machines of the latest type as fast as they were obtainable. Complete records are kept on each drill, and when repair costs become excessive the machine is replaced with a new one. The machine is dismantled and many of the parts salvaged for reuse. A typical record is that of a DA 30 automatic with New York backhead, steel centralizer and 1-in. hexagon chuck which was put in use in September, 1947, and had drilled 20,900 ft. at a cost of $0.0146 per foot of drilling at the end of 1950. In the first 10 months of 1951 this

EXPLOSIVES ARE PALLETIZED for efficient handling, with 30 cases per pallet, and are so stored. Individual cases are handled only when finally issued to miners.



THIS 10,000-LB. MOBILE CRANE has proved its value for moving heavy equipment on surface about plant. Many items in original crates are moved with fork-lift trucks.

machine cost has jumped to $0.05 per foot, so the next time it comes out for major repair it is possible that it may be discarded and the parts salvaged. For cost purposes, drills are written off in 48 months, but their life usually exceeds this figure, depending on amount of use. This machine has now been in actual service for 50 months.

Main Line Haulage Speeded, Maintenance Cut

5. Ore Handling Improved. All ore produced in the Star mine (approximately 1,000 tons per day) is transported to the main shaft, a distance of 9,550 ft., and is then hoisted 2,000 ft. to surface. The nature of this ore is such that repeated handling before finally being hoisted to surface makes it very sticky and difficult to remove from the cars after the long haul to the main shaft pocket.

Much time was lost in dumping and cleaning cars and there was excessive breakage of cars and haulage motors in attempting to jar the muck loose from the cars. A special type of car was designed which automatically dumps the load at the side of the track while the chassis remains stationary on the track. Unlike the rotary dump, the body hits spring bumpers which tend to jar the sticky muck loose. The one-piece body is all-welded without doors and has a very low center of gravity. This allows faster haulage speeds with greater safety, and reduces track maintenance.

This improvement in ore haulage, coupled with faster handling of materials handling operations, has been responsible for the savings shown in the accompanying graph.

All Materials Are Now Handled Mechanically

6. Money Spent To Cut Manual Work. Since labor represents over 70% of the total cost of mining and wages have increased more, proportionately, than any other item in the mining industry, and every phase of the operation requires expensive labor in its performance, it follows that the expenditure of considerable sums is justifiable to eliminate as much labor as possible. The accompanying graph shows this increase in average cost per man-shift to the company.

Today practically every item, representing any volume, is mechanically handled at the Star mine. This includes explosives, nails, chemicals, cement, stulls, machinery, equipment, lagging, chute timber, slide boards, headboards, shaft timber, ties, and other items.

Explosives are delivered in palletized form, with 30 cases per pallet. They are stored in the magazine and re-issued in this form and single cases are not handled until they are issued to the miners for loading the individual rounds in blasting.

Nails and cement are delivered in car lots and are palletized as they are unloaded from the box cars for storing in the warehouse. Underground orders are then filled in palletized form from this stock. Chemicals for the mill are handled from truck or freight car to storage by pallet, but do not remain on pallets in storage, as do the cement and nails.

Machinery and equipment such as slushers, rock drills, pumps, fans and motors are stored in their original crates to facilitate lift-fork handling, but are removed for final shop inspection before being placed in operation. All such equipment returned to the surface for repairs or storage is first steam-cleaned, overhauled, then repainted and returned underground or placed in the warehouse for storage.

Stull Handling Simplified by High Line and Layout

7. Round Timber From Flat Car to Saw Mill. The handling of stulls from flat cars to pile is facilitated by an overhead high line traveling on parallel rails which traverses the total length of the stull yards. This arrangement allows the stacking of each size of stull on its respective skids.

In operation, the logs are cut from the flat car onto a platform parallel to, and at the same elevation, as the flat car. As they are tallied, they are picked up by a special fork on the high line which is operated by a double-drum hoist. This fork is loaded at the platform and unloaded on the skids automatically by the operator. He requires no help in engaging or disengaging the logs since they are

not dogged in any way, but merely cradled in this fork until the operator elects to drop them on the pile by manipulation of the cables. From one to six logs can be handled per trip, depending on size and length of the logs so as not to exceed the load capacity of the cable.

An all-electric overhead monorail is used to transport logs from the skids into the mill. This carriage utilizes an oil hydraulic lift as well as a hydraulic transmission travel motor.

The operator rides this carriage inside a cage which also houses the operating controls. This arrangement allows 100% selectivity in placing the logs for filling all special orders.

After the stulls have been cut to length, split, slabbed or otherwise processed, they are packaged for transportation to their destination in the mine by banding with ¾-in. by 0.035-in. strapping. Short products, those 10 ft. long and less, are handled by ordinary lift forks from one to three bundles per trip. Longer material, such as long caps, stringers and shaft timbers, is handled with a straddle truck between mill and shaft collar.

Inasmuch as the surface plant is so restricted in area, due to the topography of the canyon at this point (the creek and railroad both run through the hotel), it has been necessary to utilize every available square foot of space for handling and storage. Previously it was thought impossible to construct a road from highway to dump level about 30 ft. above.

However, a concrete roadway was constructed on the dump by removing railroad sidings, supporting the dump spur on a concrete retaining wall and locating the roadway beneath the stull platform mentioned. In effect this forms a 12-x18-ft. tunnel through one side of the stull yard. It was also necessary to cross this road with all logs going into the mill. This, in addition to extreme snow and ice conditions, precluded the use of a green chain; hence the specially designed carrier used between yard and mill.

Lagging and Dimension Timber Bundled for Handling

8. Distribution of Lagging Speeded. Previously all lagging and other dimension material was stored several hundred feet from the shaft collar. This material was transferred laboriously by hand from flat cars to the pile a piece at a time and subsequently reloaded on mine trucks in the same manner to be taken to the shaft collar. At the shaft this operation was repeated at top and bottom in like manner and again as it arrived in the Star by truck. A piece of lagging was handled seven times to reach its destination. It required a six-man crew one shift to unload and stack a carload of lagging under the old method. Lagging, like all other dimension material, now arrives in bundled form. It requires two men about one hour to unload a flat car, or one-twenty-fourth of the time previously required.

Three bundles are unloaded from the flat car at a time. Each car contains 42 bundles of lagging or a varying number of other sizes. A three-bundle tier requires an average of two minutes from car to pile which allows 30 minutes for unloading and 30 minutes for placing spacers and other related work.

The entire yard area is paved with concrete. All surface transportation is on rubber and no mine cars are used above ground. This expedites snow removal from working areas by rotary and blade plows.

In handling bundled material from saw mill or storage piles to the shaft, the large lift fork, which unloads flat cars, is used to place the next day's run of material in the head house near the shaft collar.

A second lift fork unit of 2-ton capacity is equipped with a combination squeeze, lift, tilt and rotating fork which picks up each bundle from its horizontal position and stands it on end on the cage decks to be lowered. A similar unit, but battery-powered, removes the bundles on the main haulage level and loads them horizontally on the mine trucks to be transported into the Star, a distance of nearly 2 mi. This operation is repeated at the two shafts in the Star with a similar battery-powered unit. As the bundles arrive on their final level they are swung from the cage to a truck with a tugger hoist and tongs. The strapping is cut at the point of delivery on the level for transporting into the stopes as required.

Cagers have now become so proficient in the use of these "squeeze" units that all types of material, supplies, and equipment are speedily handled with them on the main stations without damage.

Fully Automatic Pumping Equipment Provided

9. Pumping System Modernized. The Hecla mine, which was operated through the same shaft as the Star mine, was mined out in 1944. After it was abandoned it was necessary to keep the shaft unwatered below the Star loading pockets, a distance of over 200 ft. Calculations indicated that approximately one year would be required for the Hecla workings to fill to this horizon if Star water was allowed to flow into the Hecla. Actually, pumping was resumed in the latter part of 1945.

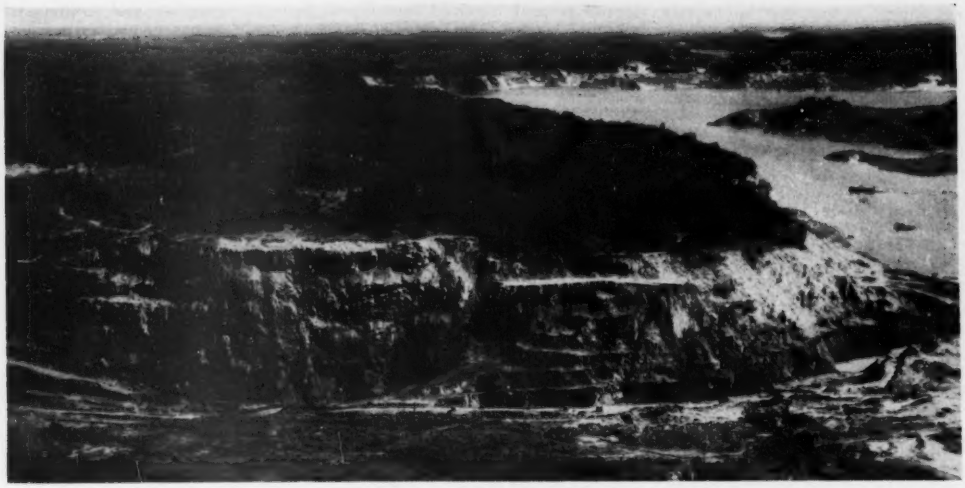
This interval allowed sufficient time to pour a concrete plug in the shaft below the 2,000 pump station pockets to hold the water down in the shaft and at the same time furnish a flooded suction for the main 2,000 pumps. The sump on the 1,200 level was changed so the pumps there would also have a flooded suction.

New pumps with the highest practical efficiency rating were purchased for both levels. These pumps were made fully automatic, being equipped with automatic priming and start and stop interlocked between levels. Any combination of pumps can be made to start or stop at a predetermined water level.

Much delay was experienced in obtaining all necessary control equipment and savings in both labor and power were effected gradually over a long period of time, as shown on the graphs. Originally, it required seven pumpmen to operate the two stations around the clock, seven days per week. At present one man on day shift spends part of his time each day in checking these pumps and the balance of the shift checking other pumps through the mine. Hence, less than one man-shift per day is now required to operate these pumps.

10. A More Efficient Heating System Installed. Considerable work has been done to make the entire heating system more efficient. New boilers have been installed and made automatic. Here again this has cut the labor requirement to day-shift operator

(*Concluded on p. 102*)



ERRINGTON MINE, on "B" orebody, near south end of what was the middle arm of Steep Rock Lake before dewatering. In seven years up to end of 1951, it has yielded about 7 million tons of high-grade ore. After 1953, underground operations will replace present surface mining. In right background can be seen Falls Bay area of east arm of lake, still under water. For continuation of bed of middle arm to left see photo opposite.

Steep Rock's Huge Reserves

Billion ton potential of high-grade iron ore means added prosperity for the Dominion and an accessible ore supply for U.S. furnaces.

M. S. FOTHERINGHAM
President and General Manager
Steep Rock Iron Mines, Ltd.
Steep Rock Lake, Ont.

DEVELOPMENT OF CANADA'S abundant resources of iron ore will have a profound effect on the country's economy. Many people who are unquestionably interested in the Dominion's future fail to realize this, despite the shining demonstration the United States has long provided of the importance of an iron and steel industry to a nation's prestige and prosperity. The United States produces more steel than any other nation, consumes more per capita, and exports more. Its dominant position industrially and its prosperity are attributable basically to the great development of its resources of iron ore and its steel industry over the past half-century. In the last 100 years the United States has produced 2½ billion tons of iron ore. In contrast, Canada has turned out less than 1% of this tonnage, or only 20 million tons.

Nevertheless Canada has a huge reserve of high-grade ores in Ontario, Newfoundland, Quebec and Labrador. In the Steep Rock Range alone of western Ontario, work has already been done that indicates the probable existence of a half billion tons per 1000 ft. of depth, in deposits expected to extend to a depth of 3,000 ft. or more.

In most cases the development of these Canadian ores has only recently begun. As it progresses Canada should become one of the world's major producers and exporters of iron ore. The development will benefit people on both sides of the border. For Canadians it will create new employment, new communities, new transportation facilities. For Americans it will supply ore to maintain long established furnaces, if not new ones. For all, it will create investment opportunities.

Iron Ore for Export For Steel Making

Today, Canada's "iron age" is just beginning. This is the good fortune of the present generation in the Dominion. Interest has revived in the country's strategically situated iron ore areas. Their development, long overdue, is under way. Everywhere the demand for iron and steel is growing. More ore is needed for the expanding steel industry on this continent.

North America's steel industry is indeed expanding astoundingly. In 50 years, while the population of the United States was doubling, the steel industry of the country increased its production rate sevenfold. Three years ago it had an annual ingot capacity of 96 million tons and an increase to 110 million tons was thought ample for all requirements. Today the industry is building for an annual rate of 120 million tons by 1953—impressive evidence of the growing demand for steel. The amount of iron ore required to feed these plants at capacity—some 150 million tons—is 30 million tons greater than the tonnage consumed in 1950. Three factors are responsible: defense needs; the encouraging results of mar-

DEWATERED BED OF MIDDLE ARM stretches north from lower right to upper left. "A" ore zone, now being stripped for new Hogarth pit, is on far side where lake bed passes off picture to left. Ore from Errington pit, right center, goes by truck to screening plant, to conveyor, to railroad loading bin (all in left foreground). On hill, midway in lake bed, shaft has been sunk for developing Errington underground mine.

an Ace for Canada's Future

ket studies of the long-range demand for steel; and the government's action permitting accelerated depreciation and amortization of capital investments.

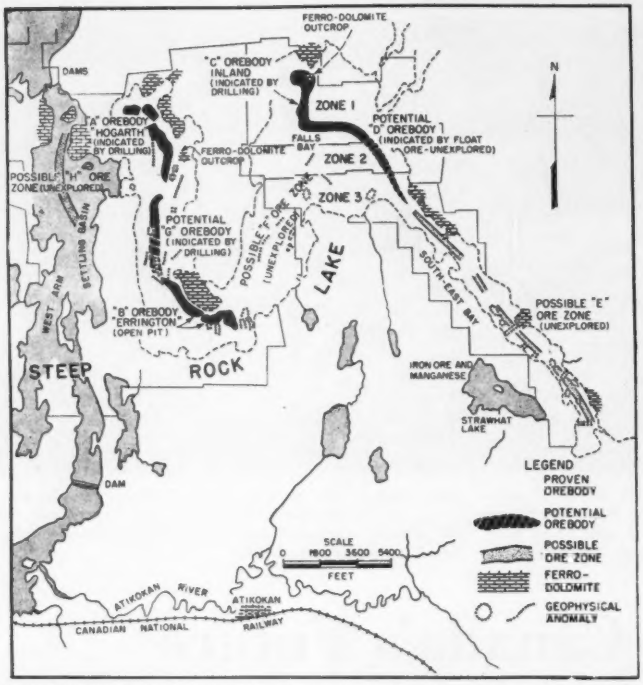
Canada is in a preferred position to benefit from this growing demand for iron ore. The huge deposits occurring in Venezuela, Brazil, Africa, Chile, and in other countries are, compared with those in Canada, much less accessible and involve higher development costs, and shipments from them are bound to be vulnerable in time of war. The opportunity must be seized to make the most of Canada's iron ore potentialities. The major deposits already known in the Dominion are likely to provide 30 to 40 million tons of high-grade ore annually within the next 10 to 15 years.

Specifically, Canada's great opportunity today is to become a major exporter of iron ore to the United States. While the use of steel per capita is undoubtedly due for an increase in the Dominion and Canada's steel industry may be expected to expand with the growth of population and industrialization, the domestic market is not big enough as yet to justify production of many types of steel. Production of pig iron and steel ingots for export instead of the export of the crude ore has been suggested but does not appear to be economically feasible. A big deterrent is that the steel industry in the United States is quite properly determined to make its own iron and steel. The ore shortage that Canada's neighbor faces currently is unique in its history.

Canadians also remember that a good part of Canada's steel industry in the past was based on ore supplied by United States producers and that much of the capital for developing the Dominion's resources has come from across the border.

The problems involved in developing one of the Dominion's major iron ore occurrences and the influence of the development upon

ATIKOKAN, ONT., shipping point on Canadian National for Steep Rock ores, 140 mi. west of Port Arthur on Lake Superior where ore is transferred to lake boats. In background, greatly foreshortened, is Steep Rock Lake.



POSITION OF ORE ZONES indicated by exploration drilling and study of geology is indicated approximately. In general they occur along the 11-mile-long axis of the roughly M-shaped lake.

the country's economy are exemplified by the Steep Rock project. A summary may be interesting:

Steep Rock's deposits, like those of the Mesabi Range, are favorably situated with respect to rail and water transportation. They lie a few miles north of the railroad between Winnipeg and Port Arthur, Ont., about 140 miles west of the latter point, which is on the north shore of Lake Superior at the so-called "head" of the lake. Prospectors had noted the area in the early Eighties. Dominion Survey geologists W. H. C. Smith and W. McInnes studied the abundant high-grade hematite float that littered the land south of Steep Rock Lake, and on a map published in 1897 noted that an iron-bearing horizon appeared to lie beneath the waters of the lake.

The source of the float ore remained undisclosed until Julian G. Cross and the late Joseph Errington, who had undertaken to explore the area by diamond drilling, cut iron ore in the lake bed in what they named the "A" zone. This was in the winter of 1938. The next four years saw more drilling, mostly from the ice, which outlined what are now called the Hogarth (A) and the Errington (B) zones. The probable existence of other zones in the lake bed was also indicated by geological studies and further drilling.

Before mining on a commercial scale could be attempted, it was evident that the lake would have to be dewatered, at least partially. This in turn necessitated the diversion of the Seine River which flowed into it. The engineering problem was studied while exploration was under way. By the end of 1942, enough ore had been disclosed to justify the expense, and the diversion work was started in 1943 when the necessary money had been provided. The course of the river was diverted to a new one 4 miles northwest, this involving many unique problems.

Diversion was completed by the end of 1943 and Steep Rock Lake, 7 sq. mi. in area and 140 to 350 ft. deep, had been isolated by coffer dams, ready for dewatering that portion of it above the ore deposits disclosed by drilling. By December, 1943, fourteen 24-in. pumps, capable of handling a total of over 300,000 gpm., were at work. Nine months later, in October, 1944, the surface had been lowered sufficiently to expose the top of the "B" deposit and sufficient stripping had been done to let mining start. This was Steep Rock's first mine, an open pit on the "B" zone, later named after Mr. Errington. Up to the end of 1951, the Errington pit had yielded about 7,000,000 gross tons of high-grade iron ore and had attained an annual production rate of 1,200,000 tons.

After 1953, the Errington open pit will be replaced by an underground mine, the company's first, now being developed on the lower portion of the "B" zone. Plans call for an annual production of 1,500,000 tons. They include some novel installations, such as an underground headframe and plant buildings inset in a rock dome. Mining will be done by block-caving and hoisting by conveyors.

At the same time, the "A", or Hogarth, orebody, where drilling first disclosed the existence of ore beneath the lake, is being prepared for production by open-pit methods. Production should begin in 1953. Plans call for an annual rate of about 2½ million tons. The Hogarth project involves the stripping, by cutter dredge, of about 45 million cubic yards of clay now overlying the ore. The dredging plant is the largest of its kind in the country, with a capacity of 1½ million cubic yards per month. It cost $2,000,000.

The development program now in hand, it is seen, will give Steep Rock a production rate of 3½-4 million tons of high-grade iron ore per year in 1953, as compared with 1¼ million tons at present. Of this total 2½ million tons will come from the new Hogarth pit and 1½ million tons from the new Errington underground mine.

Still further expansion of operations is contemplated.

Potential Capacity Large

The Steep Rock company seeks the most rapid development of its full resources with the least capital expenditure. It is retaining all of the western two-thirds of the 8,000-acre property for its own mining operations, and has made areas in the eastern third available to other operators on a royalty basis.

Arrangements made with two groups of iron and steel companies for development of the "C", "D" and "E" areas in the eastern third of the property provide for inten-

sive exploration over a short term, followed by immediate development on a royalty basis and on a scale consistent with the reserves that complete exploration has disclosed.

With these experienced operators providing the capital and management for development of the eastern third of the Steep Rock Range, the Steep Rock company plans to develop systematically the several deposits in the western two-thirds. As already indicated, the areas retained include the "A" and "B" orebodies, or zones, as well as the 6500-ft. long zone in between these two, which is known as the "G" ore zone. These three zones extend over a total length of almost three miles. Preliminary exploration on the "G" zone has been most encouraging. Also retained is the "H" zone under the west arm of the lake, the geology of which is favorable.

As already mentioned, the Steep Rock company has been considering a much larger expansion program for the "A", "B" and "G" zones, to give a greater annual output rate than the 3½-4 million tons planned for 1953. Studies made suggest that if these three contiguous zones were completely developed, a production rate between 6 and 9 million tons per year would be possible. Current exploration on the eastern third of the property, in which areas are under option to the two groups of iron and steel operators mentioned, is expected to justify an additional production of as much as 6 million tons per year. Under such favorable outcome the Steep Rock deposits could be made to yield as much as 12 to 15 million tons per year.

A Half Billion Tons Per 1000 Ft. of Depth

To get an idea of the possible ultimate ore potential of the Steep Rock deposits over the long term, one must link the results obtained by actual exploration with all of the existing geological evidence. The difficulty encountered can be appreciated when we consider that one or more of the three dimensions of each deposit is usually not established until late in the life of the mine.

The high-grade ore deposits of the Steep Rock Range, held to be of hydrothermal replacement origin, occur along the 11-mile long M-shaped axis of Steep Rock Lake. They are found on the almost vertical contact of the Steep Rock sedimentary formation and the overlying volcanic series. The property is so extensive that exploration has been concentrated principally on only three of the seven or more geologically favorable areas. It is also under way on two other zones. At least three other zones remain to be investigated. The geological evidence indicates that each of these deposits should extend with undiminished grade and area to depths of possibly 3,000 ft. and more. The combined length of these deep-seated deposits is believed to be about 4 miles and the average width about 250 ft. This suggests a prospective ore potential of possibly 500 million tons per 1000 ft. of depth.

Overall Development Cost Under $10 Per Annual Ton

Comparison of the cost of developing the Steep Rock deposits with the cost of other projects undertaken to make new ore supplies available to the steel industry is quite favorable to Steep Rock.

The great demand for ore, coupled with the rapid depletion of direct shipping ores of the Mesabi, is bringing about the opening of new ore sources in remote places and the development of low-grade taconite in the United States. These will be high-cost developments—the cost probably being close to $20 per ton of annual production. In contrast, the development expenditure at Steep Rock will be more attractive.

Pre-production expenditures at Steep Rock amounted to a little over $10,000,000. This included acquisition of property, extensive exploration, diversion of the Seine River, and dewatering of Steep Rock Lake. The indicated overall development cost for Steep Rock, including future expansion plans, is less than $10 per ton of annual capacity.

Such costly development of new iron deposits outside of Canada would seem to presage an upward trend in iron ore prices. Since 1939 these have increased much less than the prices of many other products. In this period, iron ore prices rose 68%, while coke increased 100%, wholesale commodity prices 131%, copper 119%, pig iron 149% and scrap 164%.

Canadians will benefit from the development of their iron ore resources. Large-scale iron mining requires huge capital expenditures for transportation facilities, mining equipment, power supply, housing, and other items. In the case of Steep Rock, transportation companies will derive about $25,000,000 from the transportation of each 10,000,000 tons of ore. Approximately 100,000 hp., costing $2,000,000 per year, will be required in developing the full ore potential. Fuel oil and other petroleum products will be about $2,500,000.

Every new Canadian iron mining development in prospect today requires the creation of entirely new communities. A few years ago Steep Rock's railway point—Atikokan, Ontario—was a hamlet of 300 people. Today it is a vigorous young town, rapidly acquiring the amenities of civilization. Its population is now close to 3,000, and, as it grows pro rata with expansion of mining, a population of over 20,000 people within the next few years is not bevond reasonable expectancy.

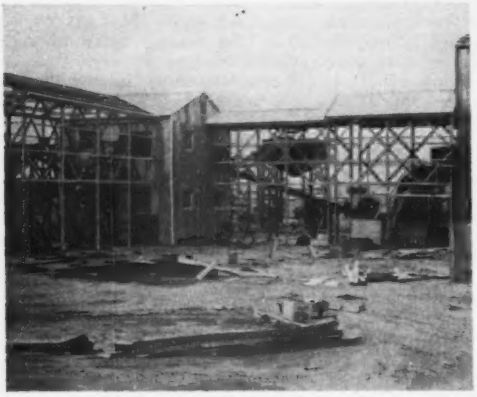
In the mining communities of Minnesota—and the situation in Canada should be comparable—it has been found that for each thousand persons employed at the mines there are approximately two thousand employed in other trades, with the total working group supporting 4,500 dependents, thus making a total population of 7,500 per 1,000 mine employees. Further, it has been established that an average mining community requires a retail establishment of some kind for each 75 persons, and each person accounts for an annual retail trade of almost $1,000. On this basis, annual retail trade directly within a community would total $7,000,000 per 1,000 mine employees.

Impact on Economy Will Be Great

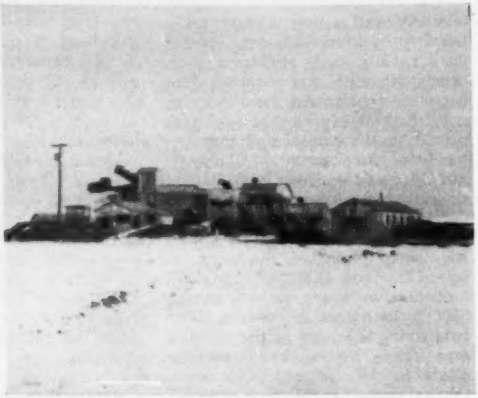
Steep Rock's 1951 production of 1,326,724 tons was sold at lower Lake ports for $11,589,000. Multiply this sum by 25 and you arrive at a reasonable expectation of the annual value of Canada's iron ore production within a very few years. In the face of such figures, none can deny the terrific impact which iron mining is bound to produce upon the Canadian economy.

The importance of the Canadian mineral industry is generally recognized, but only in very recent years has iron ore been a significant factor in the growing value of our mineral production. Last year the value of iron ore ranked sixth in the list of metallic minerals. When iron production climbs to a rate of 30 million tons annually, as it will in all probability, its value will far outrank that of any other mineral — metallic or nonmetallic — produced in Canada.

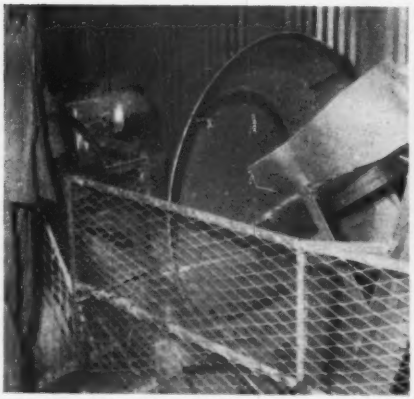
Compactness, central visibility, and ample room for access . . .



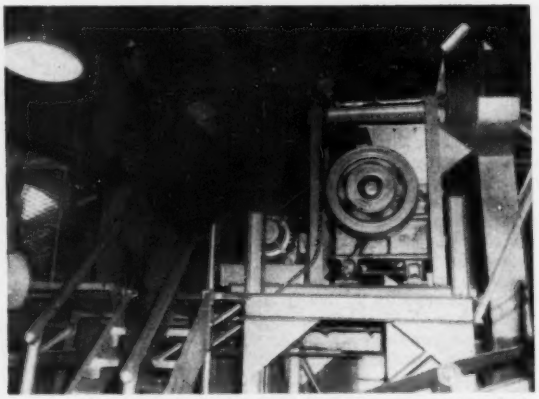
VIEW OF PLANT UNDER CONSTRUCTION shows flow layout. Right-angle turn at crusher building (left center) gives operator view of all conveyor belts.



COMPLETED PLANT was turned over to Atomic Energy Commission. American Smelting & Refining Co. now staffs and operates the plant for AEC.



SNYDER CUTTERS like this one were chosen over Vezin type to minimize headroom.

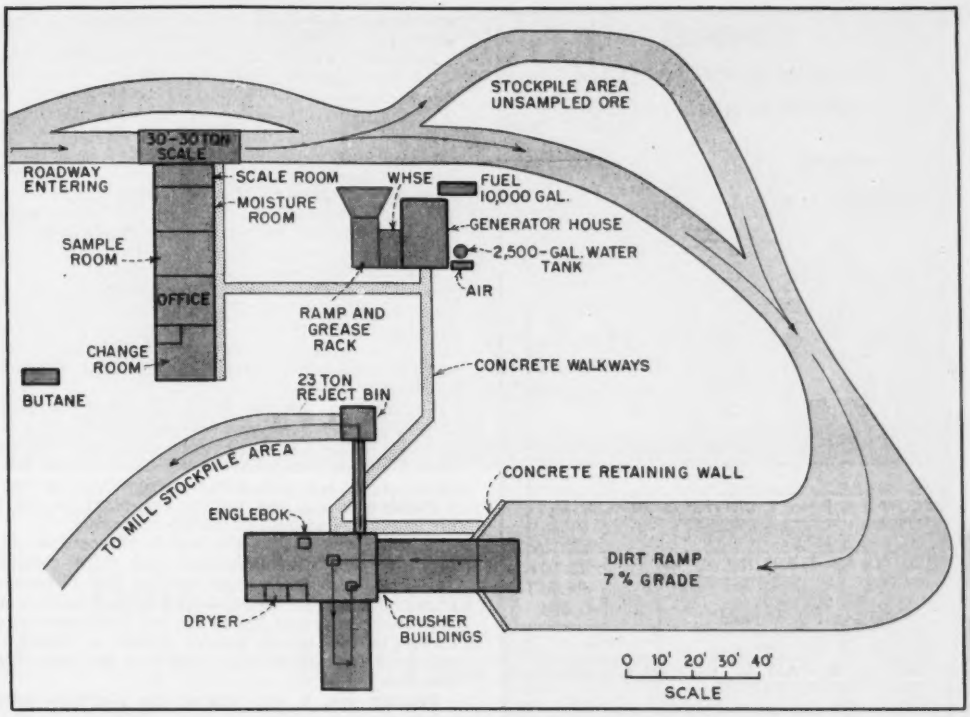


NO. 2 AND 3 CRUSHERS are mounted on operating deck. View shows sturdy substructure which reduces vibration.

SAMPLE-CUTTING AREA is provided on concrete crusher-room floor next to dryer.

MOISTURE ROOM is equipped with butane-fired dryer, handy to weighing scale on nearby bench.

are emphasized in plant layout.



Our thoughts, problems and their solutions in designing the new . . .

Shiprock Uranium Sampler

Author
G. R. KENNEDY
Vice President
and
General Manager
Navajo Uranium Co.

THIS IS A BRIEF STORY which covers the engineering highlights of the new uranium sampling plant near Shiprock, N.M. It does not cover detail design problems.

First of all let's take a look at the completed plant: It stands in northwestern New Mexico about 1 mi. south of Shiprock on U.S. 666 and about ½ mi. off the highway. It was designed for local ores, most of which are expected to come from the Navajo Indian Reservation. It has a rated capacity of 50 to 60 tons per hour. Total cost of the plant, including the automotive equipment (two dump trucks, one Ford pickup, one pneumatic-tired 1-cu.-yd. loader) and including all road work and so forth, was $98,000.

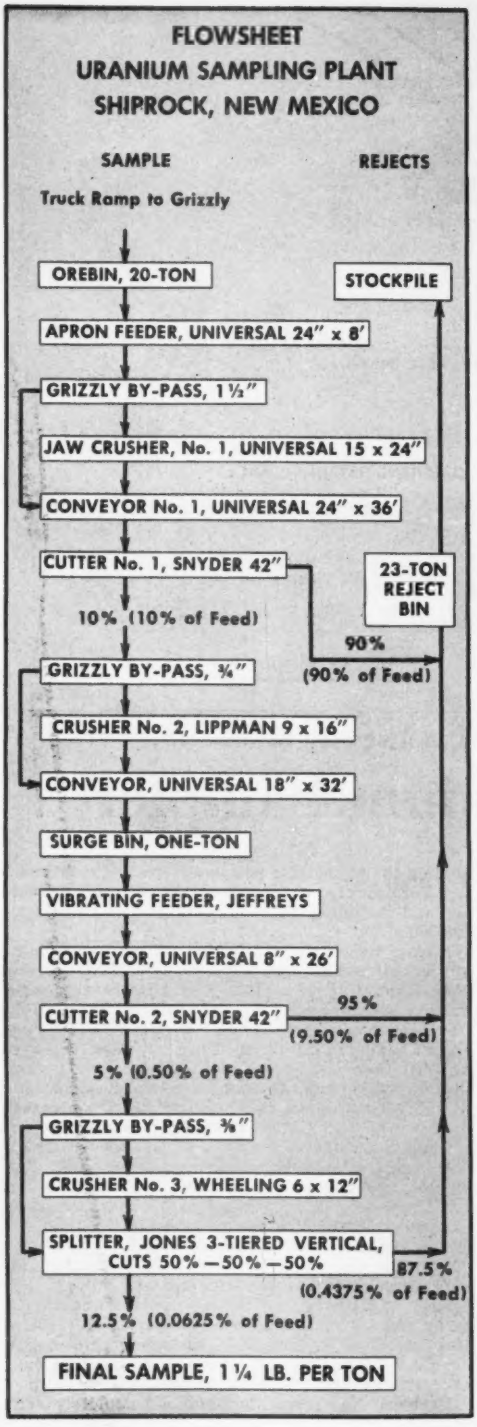
Navajo Uranium Co. designed and built the plant, and effective Jan. 3, 1952 leased it to AEC for one year. Operating the plant for AEC in the same manner as it operates the plant at Monticello, Utah, American Smelting & Refining Co. started receiving ore on January 7. Vern Tarne, former manager of the Marysvale, Utah mill, is now manager of the Shiprock plant. Ore which meets specifications of the AEC program and non-specification ore containing 6 to 16% $CaCO_3$ are being accepted.

Thoughts on Design. Our main job was to design and build a plant that would operate efficiently and would yield a 100%-fair sample. Our ideas on the structure were to keep it compact with a minimum of headroom, and to make it as fully automatic as possible in order to minimize labor.

We also wanted to lay out the plant so that all operations could be seen from a central point.

Keeping in mind that the whole plant would have to be cleaned from hopper to hopper after each lot was sampled, and that repair and maintenance should be simplified, we wanted to provide easy access to all belts, hoppers, motors, and so forth.

Problem No. 1 was to build a completely self-



contained unit on level terrain at a location with no water, power, fuel, or sewer facilities.

Solution: Power is supplied by a Hercules 270-hp. diesel-generator set delivering 125 kva of 440-volt 3-phase power at 1,800 rpm. A standby power line is connected to the Indian Service system at Shiprock where power will be available at a later date. Heat is supplied by a butane-propane installation. Water comes from a shallow well in the bed of the San Juan River some 2,000 ft. from the plant. A pressure pump system supplies water for the sanitary conveniences and so forth; a septic tank and field system takes care of the wastes.

Problem No. 2 was to design the plant to handle wet ores at a maximum rate. During the winter months, much of the ore runs as high as 17% moisture, while the average runs 3 to 5%. When the moisture content runs over 7%, the ore is very difficult to handle, particularly if fines are predominant.

Solution was putting grizzly by-passes in front of each crusher, re-mixing the fines with the crushed product at the discharge of each crusher. On dry ores the plant's capacity is approximately 60 tons per hour; on wet ores it varies from 20 to 30 tons.

Problem No. 3 was getting the plant to cut a predetermined amount of sample uniformly.

Solution was making the feed to the cutters uniform, particularly the second and third cutters. This was accomplished by feeding the discharge from No. 2 crusher into a surge bin, and controlling flow from this surge bin to the No. 3 conveyor and thence to the second Snyder cutter. A rheostat-controlled Jeffrey vibrating feeder at the surge bin does this job

Problem No. 4 was making the plant as fully automatic as possible.

Solution: The plant is 100% electrically operated through a central control panel; it is interlocked and sequence-wired with remote-control switches at the primary-crusher station and at the operating deck of No. 2 and 3 crushers. One novel feature of the reject bin is a self-closing gate designed and built by Navajo Uranium Co.; the gate is opened by the tail-gate of the truck backing under the bin to load; it closes because of an off-centering of its suspension regardless of the amount of material in the bin; the result is no spillage.

Problem No. 5 was providing for central visibility.

Solution: From one position on the operating deck of No. 2 and 3 crushers, it is possible to see all conveyors. And looking into a mirror placed over the surge bin, the operator can see whether or not the bin is full.

Problem No. 6 was providing for easy cleanup.

Solution: The floor of the deck is expanded metal so that all dust and dirt fall to the concrete floor below where it can be picked up easily with an industrial vacuum cleaner. Compressed air for cleanup is piped to each compressor station and various convenience outlets.

Problem No. 7 was to eliminate tramp iron.

Solution: A motor-generator-set electromagnet is suspended over the No. 1 conveyor.

Equipment for this plant was furnished by Western Machinery Co. of Denver. I am indebted to Leigh M. Jones and George Setter of that company for help in designing the plant.

All construction was performed by Navajo Uranium Co. employees except the carpenter work, which was done by H. C. Flaugh Construction Co. of Cortez, Colo.

THICKENER DESIGN to handle average feed, requires average power. But some materials, especially those with few slimes, will cause much trouble unless higher power needs are anticipated.

How to Calculate Power Loads for Thickeners

ROMAN CHELMINSKI
Knowles Associates
New York, N.Y.

IF CHOKED AND STALLED THICKENERS, with bent arms, twisted shafts or damaged gear units are a major worry, check your thickener power needs for a possible answer. A simple test and a few calculations can give you an accurate picture of raking loads. Your efforts will also produce some information on the efficiency of your thickener operation, and what you can do about it, if it's too low.

When a 200-ft. thickener handling a cement slurry can be driven by a 3-hp. motor, and a 325-ft. thickener moves 25,000 tons of settled solids daily using only 15 hp., you may well ask whether is it necessary to consider more than nominal power loads for average size installations. The answer lies in the surprising performance of some materials subjected to sedimentation, causing unexpected raking difficulties. The partly empirical calculations outlined here are recommended whenever big loads of sandy and deslimed materials like silica sand, phosphate rock, iron ore and coal are to be continuously thickened.

Raking loads for a given material are a function of thickener size, feed rate, slope of arms, blade angle and the slope at which the settled solids will flow by gravity. This last factor is very important. It explains why an 85-ft. diameter hydroseparator, raking 200 tons per hour of minus 35 mesh deslimed phosphate rock requires 35 hp., while a 175-ft. unit, handling 900 tph., of minus-14-mesh of the same material, but containing more slimes, requires only 25 hp. We are neglecting here, the small power requirements to overcome fluid viscosity at slow speeds.

Some empirical information is required. The friction factor of the settled material against a smooth steel plate (f_1) can be determined by settling a small tankful of feed on a steel plate. Tilt the plate until the settled solids begin to slide. The tangent of the angle of tilt gives f_1.

Friction factor, f_2, of the settled solids against a bed of the same material is obtained by noting the angle of repose of a pile of settled solids and finding the tangent of that angle. With this experimental information and the other data mentioned above, raking loads can be computed.

Our foremost interests lie in thickener efficiency and power requirements. Formulas for these quantities are derived on page 90.

$$E = \frac{f_2\cot\alpha - 1}{A\sin(\theta+\phi)\left[\cot\theta + \dfrac{\sin(\theta+\phi)}{\cos(\theta+\phi) + \dfrac{1}{A}}\right]}$$

$$P = \frac{T}{3}(f_2\cos\alpha - \sin)\frac{2r_p^3 + r_i^2 - 3r_i r_p^2}{r_p^2 - r_i^2}$$

Where α = the angle made by the bottom of the rake with the horizontal.

θ = the complement of the angle between the rake blade and the rake arm.

ϕ = the angle between the resultant force of the rake blade and its component normal to the blade.

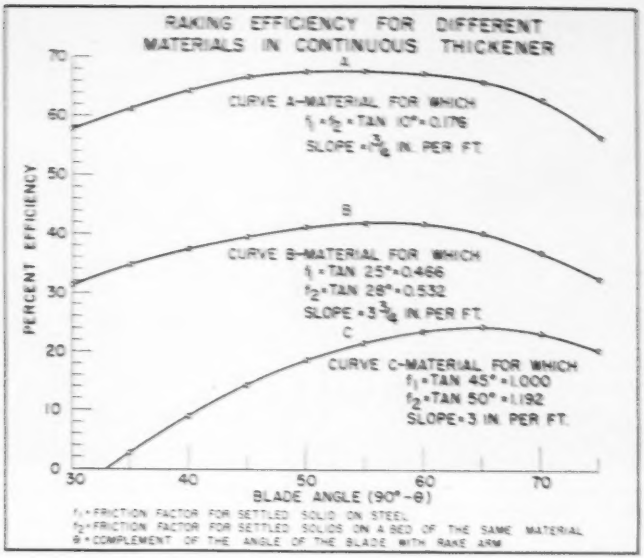
T = total tonnage of solids settling in thickener per minute.

r_p = diameter of the thickener tank.

r_i = outside diameter of the discharge trench (See Fig. 3).

$$A = -\cos(\theta+\phi) + \sqrt{f_2^2\cot^2 d - \sin^2(\theta+\phi)}$$

Net power must be divided by the efficiency to determine the actual raking horsepower. Energy dissipated in the discharge trench must also be considered.


RAKING EFFICIENCY FOR DIFFERENT MATERIALS IN CONTINUOUS THICKENER
PERCENT EFFICIENCY
BLADE ANGLE (90°−θ)
A
CURVE A-MATERIAL FOR WHICH
f1 = f2 = TAN 10° = 0.176
SLOPE = 1 7/8 IN. PER FT.
B
CURVE B-MATERIAL FOR WHICH
f1 = TAN 25° = 0.466
f2 = TAN 28° = 0.532
SLOPE = 3 3/8 IN. PER FT.
C
CURVE C-MATERIAL FOR WHICH
f1 = TAN 45° = 1.000
f2 = TAN 50° = 1.192
SLOPE = 3 IN. PER FT.
f1 = FRICTION FACTOR FOR SETTLED SOLID ON STEEL
f2 = FRICTION FACTOR FOR SETTLED SOLIDS ON A BED OF THE SAME MATERIAL
θ = COMPLEMENT OF THE ANGLE OF THE BLADE WITH RAKE ARM

Applying the Formulas

Let's see how this worked out in two practical design problems. Take the case of a 50-ft. hydroseparator handling phosphate rock for International Minerals and Chemicals Corp. at Noralyn, Fla. Slope of the arms was $3\frac{3}{4}$ in. per ft., making $\alpha = 17.3°$. The blades were set at 60° from the rake arm so that $\theta = 30°$. Tests on the phosphate particles gave the following friction factors:

$f_1 = \tan 25° = 0.466 = \tan \Phi$
$f_2 = \tan 28° = 0.532$

Substituting in the formula for efficiency, we find that efficiency equals 42%.

With a tank diameter of 50 ft. and a rate of feed at 600 tph, we find that net horsepower = 1.83.

Gross hp. 1.83/0.42 = 4.4
Discharge trench hp. = 0.5
Total hp. output = 4.9

If the drive efficiency of the worm gears is 50%, then the unit will need a 10-hp. motor.

Our second example is the 150-ft. dia. hydroseparator of the Coronet Phosphate Co., handling 300 tph of phosphate rock. Slope of the arms was 3 in. per ft. Friction factor f_1 was found to be the tan 22°, and f_2 = tan 26°. Calculated efficiency was 45.7%.

Calculating power requirements we find that net hp. = 3.6.

Gross hp. = 8
Discharge trench hp. = 2.6
Total hp. = 10.6

If the drive efficiency of the spur gears is 70%, we find that a 15-hp. motor is required. It happens that a 20-hp. motor was installed, but actual power readings averaged about 15 hp.

If your thickener chokes and stalls, you can apply these same calculations. If you find that your motor doesn't meet the power requirement, you have probably located the source of your trouble.

How About Efficiency?

Can thickener efficiency be improved by changing the blade angle? The curves at left show calculated efficiencies for blade angles varying between 30° and 70° under three different sets of conditions.

Curve B covers the conditions prevailing in the 50-ft., thickener at Noralyn, Fla. Curves A and C are hypothetical cases representing extreme conditions. Curve A might represent a free flowing pulp such as a finely ground flotation concentrate. Curve B, with high friction factors, might be representative of conditions in settling magnetized magnetite.

When the friction factors are low, the blade angle is not too critical as the curve is almost flat for angles from 50° to 65°. The standard 60° blade angle is close to the maximum efficiency in all cases, but the optimum angle shifts from about 55° for case A to about 65° for case C. If for any reason, the blade angle is smaller than normal, it could really make a difference in handling materials represented by curve C where the efficiency curve is very steep for smaller angles.

Derivation of Formulas for Raking Load and Efficiency

STEP 1. FORCES INVOLVED

FOR CONVENIENCE, let us first establish the efficiency of the raking mechanism. In Fig. 1, line 00′ represents the thickener bottom below the rake arms, sloping at angle 2 with the horizontal. An elemental quantity of settled solids, has a weight dw which can be divided into dw cosα, normal to the bottom, and dw sinα directed toward the center of the cone constituting the thickener bottom.

Fig. 2 is drawn in the plane tangent to the bottom cone and containing line 00′ of Fig. 1. Since we are dealing with elemental quantities in the immediate vicinity of dw, the plane of the paper can be assumed to coincide with the surface of the bottom cone. Then C is a horizontal circle on the surface of the cone passing through dw, and C′ is another horizontal circle at a distance dr, from C. XX is a tangent to circle C, and PP′ is a rake blade set at angle θ to XX.

If there were no friction between the solid element and the rake blade, the blade would exert a force, F_n on the solid element at right angles to blade PP′. But friction force, F_f,

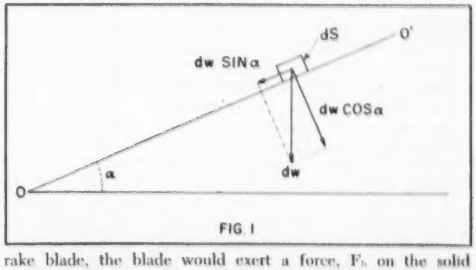


FIG. 1

must be taken into account, so that the resultant force exerted by the blade is F_r, at an angle ϕ from F_b. This angle is such that $\tan\phi = f_1$.

Another force acting to move the elemental solid dis, down the slope of the cone is F_g which equals dw sinα (Fig. 1).

Resultant of all these forces is the vector F. The direction of this vector determines the path the solid element will travel. Its magnitude must equal the force resisting motion, $f_2$dw cosα (Fig. 1) where f_2 is the friction factor of the settled solids on a bed of the same solids.

Vectorially we have

$$F_r = F_b + F_f = F_r\sin(\theta+\phi) + jF_r\cos(\theta+\phi)$$

relative to the axes XX and OO'. ($j = \sqrt{-1}$)

$$F = F_r + F_g = F_r\sin(\theta+\phi) + jF_r\cos(\theta+\phi) + jdw\sin\alpha$$

But $F = f_2 dw\cos\alpha$ also, so we can equate the two expressions.

Since the square of the real numbers added to the square of the imaginary numbers equals the square of the magnitude of the resultant vector, we have a relation in which we can solve for F_r.

$$F_r = dw\sin\alpha\left[-\cos(\theta+\phi) + \sqrt{f_2^2\cot^2\alpha - \sin^2(\theta+\phi)}\right]$$

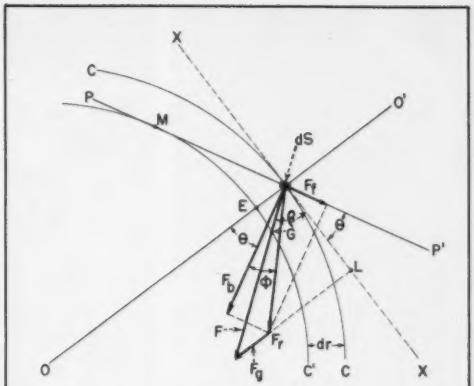


FIG. 2

STEP 2. CALCULATING EFFICIENCY

To calculate efficiency, it should be pointed out that while F is the resultant of all forces acting on the solid element, F_r is the resultant of forces applied by the rake blade. Since the blade rotates in a circular path, the work imput is the projection of F_r on XX times the distance traveled by the blade when the solid element moves toward the center, a distance dr. When the element dw travels from O to G, point M of the blade has traveled from M to G.

W_i (Work input) = $F_r\sin(\theta+\phi)$ x (distance MG)

Since distance MG = ME + EG,

$MG = dr\cot\theta + dr\cot\beta$

where β is the angle between F and XX, and can be determined as follows:

$$\text{Cot}\,\beta = \frac{F_r\sin(\theta+\phi)}{F_r\cos(\theta+\phi) + dw\sin\alpha}$$

Substituting;

$$W_i = F_r\sin(\theta+\phi)\left[dr\cot\theta + dr\frac{F_r\sin(\theta+\phi)}{F_r\cos(\theta+\phi) + dw\sin\alpha}\right]$$

Work output, or useful work, is that of dragging the solid element dw, a distance dr, toward the center of the machine, deducting the help of the force of gravity (Fig. 1).

$W_o = f_2\,dw\cos\alpha\,dr - dw\sin\alpha\,dr$

Since efficiency E, equals W_o/W_i, substituting we get

$$E = \frac{W_o}{W_i} = \frac{F_2\cot\alpha - 1}{A\sin(\theta+\phi)\left[\cot\theta + \dfrac{\sin(\theta+\phi)}{\cos(\theta+\phi) + \dfrac{1}{A}}\right]}$$

where $A = -\cos(\theta+\phi) + \sqrt{f_2^2\cot^2\alpha - \sin^2(\theta+\phi)}$

STEP 3. CALCULATING RAKING LOADS

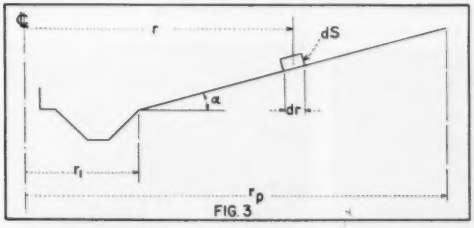


FIG. 3

In calculating raking loads, we have to know how solids will settle on the tank bottom. Distribution is important since less work need be done if a good part of the feed settles near the center of the machine, than if large loads have to be raked in from near the periphery.

We first assumed that with a central feed and peripheral overflow, solids would classify themselves concentrically. Plus-28-mesh solids would settle to a certain diameter, plus-35-mesh to a larger diameter, etc. Ratios of these diameters would be inversely proportional to the square roots of the settling rates of the mesh sizes. Computations based on these assumptions gave raking loads that were consistently too low. The explanation, we believe, is found in the hydraulics of the flows through thickeners.

Our next assumption was that sedimentation takes place uniformly over the entire area of the tank. This assumption produces results close to observations in all cases considered.

In Fig. 3, r_1 is the outside diameter of the discharge trench or cone, and r, the diameter of the tank. If T is the total tonnage settling per minute, the weight per unit area is

$$\frac{T}{\pi(r_p^2 - r_i^2)}$$

Weight per minute settling in the annulus of radius r, and width dr, is

$$dw = \frac{2Tr\,dr}{r_p^2 - r_i^2}$$

Net force required to move this weight toward the center is f_2 dw cosα—dw sinα. The work per unit of time required to bring the element dw, to the point of discharge at radius r, is

$$dP = dw(r - r_i)(f_2\cos\alpha - \sin\alpha)$$

Substituting for dw and integrating between the limits of r_p and r_i, we get;

$$P = \frac{T}{3}(f_2\cos\alpha - \sin\alpha)\frac{2r_p^3 + r_i^3 - 3r_i r_p^2}{r_p^2 - r_i^2}$$

This net power must, of course, be divided by the efficiency previously determined to obtain the actual raking horsepower. Horsepower dissipated in the cone or discharge trench must also be considered.

1 Drilling. Using singlejacks, miners select ore carefully.

2 Haulage. "A"-frame known as "Chige" plus workman equals haulage unit. Here, sorted ore from mine is going to crusher.

3 Crushing and Screening. Women on left throw weight on tread of curved lever raising stamp. Woman on right scrapes ore between pestle and die. Then power supply steps off tread. Screen on right is ⅛-in.

4 Jigging. Worker using an "Oreng," a fine-meshed basket, is primary concentrator. He works ore into layers, scrapes off tailing by hand, then middling, and finally concentrate. Hutch product (fines) goes through to tub.

5 Regrinding. "Mang" is type of buhr mill used to make rice flour. Two people on left supply motion. Small girl feeds middling through hole in top stone. Sand product emerges from between top and bottom stones.

6 Regrind concentration. Sands go to battery of workmen using shallow plaques called "Hamji."

look like this when assembled.

7 Complete mill. Manpower is an exact term here —there's nothing but. Left, crusher section. Left center, screening. Right center, jigging and washing section. Right, grinding. Far terraces are rice paddies.

Peace, sound political handling of mineral rights, modern equipment and know-how are needed at South Korea's . . .

Tongpo Kwang Tungsten Mine

By L. G. NONINI, U.N.K.R.A., APO, San Francisco

RIGHT NOW, mining in South Korea is a rugged business. Not all of it is quite so primitive as the operation shown here; most of South Korea's tungsten comes from two large, fairly well equipped mines. But much of it comes from small mines. This is a story of the hardships and rewards of one small-mine operator.

Mr. Kim, Hay Duk, a private enterprizer from Taegu, leased mining rights to a deposit near Pusan from the South Korean Government.

Briefly, here's his production setup:

There's his promising mine. The ore deposit consists of three nearly vertical quartz veins in a sheeted shear zone of undetermined width. These parallel veins have been exposed in numerous cuts for a distance of 2,000 ft. Only the main vein is being mined; it varies from ½-in. to 3-ft. wide, and averages about 10-in. Wolframite occurs in the quartz as scattered particles varying from granulated-sugar size to ½-in. From production figures, the ore appears to average slightly less than 1% WO_3. Other vein minerals are pyrite, specular hematite and chalcopyrite.

His mill. Hand sorted ore goes to the mill proper. Except for exclusive use of manpower and medieval equipment, the flowsheet is much the same as in a conventional gravity mill.

Production and income. Each 10-hour day, miners produce about 1½ metric tons of selected ore. Processed in the mill, it becomes 1½-2 tons of plus-65% concentrate each month. Mr. Kim sells the product in Pusan for $3,000 to $5,000 per ton.

And expenses. Kim's far biggest bill is for labor. Workers get a monthly wage equal to about $30, and he employs about 70 in the whole operation.

He has his troubles, too:

There's the war. The constant roar of planes overhead. Economic difficulties. But no Reds right now.

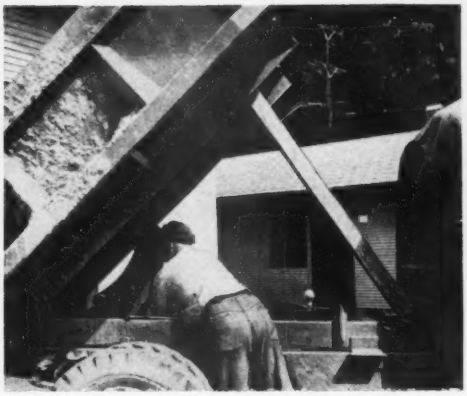
The politico-mineral setup in South Korea. The government owns Mr. Kim's mine. Abuses are common and have been a prime factor in retarding the mineral industry.

And the equipment. Kim is saving money to mechanize the operation as fast as possible. But he can never own the mine, and he knows that he may develop it only to lose it through some Korean politician's whim. The solution of this problem must wait for a change in laws governing mineral exploitation and/or the administration of those laws.

All of which brings out two points, not new, but worth repeating:

Private enterprise is a mighty strong force. Wars can't stamp it out. It can produce with the most primitive equipment, even under unfavorable laws.

There's a lot of room for international trade in minerals, modern machinery and know-how.



BLOCK THE RAISED TRUCK BODY with securely placed prop or block before attempting to work under it.

GUARD RAILS AND SEATS help insure safety of employees where trucks are used to take them to the job.

Safety Rules Save Lives, Money, In Operating Big Trucks

Certain fundamentals must be observed after proper roadways and equipment have been provided.

G. G. GRIEVE
Staff Representative
Mining Section, National Safety Council

ACCIDENTS IN THE OPERATION of heavy-duty trucks in open pit mines must be prevented. All types of workers are injured by this equipment. In many cases, employees are permanently disabled or killed. From the operating viewpoint, also, accidents must be prevented if maximum efficiency is to be obtained with truck transport.

Many of the accidents result in costly damage to the vehicles, especially when they go over dumps or off roadways. Even a minor mishap means delay and loss of production.

Although these accidents happen from numerous different causes, a high degree of safety can be achieved if only certain relatively few safety fundamentals are applied. The foundation for long periods of accident-free operation is to be found in management interest and in its leadership in taking essential steps toward this goal. This requirement is basic whether a company is large or small.

The steps to be taken proceed in two directions. They are:

(1) Building suitable temporary and permanent roadways, properly maintaining the equipment, and providing the devices necessary for safe operation.

(2) Informing and instructing drivers and other employees about hazards and essential safe practices, and following up this training by requiring compliance.

Suitable Roadways Important

Good roadways, whether permanent or temporary, pay off in fewer accidents, lower maintenance costs, and more loads hauled per shift. As commonly built, both temporary and permanent roadways often are too narrow for the equipment and for two-way traffic, especially at curves and hills.

The heavy-duty trucks at some open pit mines require roads 40 to 50 ft. wide for two-way traffic. The curves should be elevated toward the outside. Where night driving is necessary, the bank side should be marked with reflectorized signs.

A slight crown is desirable for drainage, and ditches should be provided to carry off water, particularly along permanent roadways. Good drainage helps to prevent holes and ruts and reduces the grading required. It also helps to eliminate the ice hazard in winter.

To maintain schedules safely in winter, it is well to use snowplows or blade graders to remove as much snow or loose ice as possible. Then, after the remaining ice or packed snow has been scored with a sawtoothed blade, the surface is well prepared for the application of abrasives or chemicals, by hand or by spreader. An effective treatment is to apply cinders mixed throughly with sodium or calcium chloride.

Grades, which in general should not exceed 8%, are determined by the weather, type of equipment, road surface, and other factors.

Roadways in quarries and open pit mines often are built close to high banks or faces. These should be inspected regularly for loose rock, especially after rains and freezing or thawing weather. Overhanging rock, of course, should be barred or shot down.

A GOOD DUMP MAN is insurance against going over crest. He will stand clear of truck when guiding driver.

Dust is generally given little attention in road maintenance. Nevertheless, it may be hazardous to health, it makes driving difficult, and it increases maintenance costs. Silica dust, for example, which is toxic and highly abrasive, may affect the health of workers and increase motor maintenance as well. To meet this problem, some companies provide sprinklers.

Proper Equipment Essential

A few inexpensive safety devices add greatly to the ability of a driver to operate safely. These include a windshield wiper, windshield frost eliminator, flares and red flags. Since backing accidents are numerous, a rear-view mirror is a good investment. Only the best type should be purchased, because a cheap mirror gives a distorted image. The mirror should be not less than 6 in. in diameter.

For night work a back-up light will help the driver. This safety device is standard equipment on the trucks of many companies. An automatic signaling device also has been developed to warn workers out of the way of a backing truck.

At some properties trucks are used to transport workers. This may be done safely. Provision of seats on the trucks will prevent most accidents. In many cases, however, adequate provisions have not been made. The men stand on the running board or on the truck bed and may be thrown off at rough places or at sharp turns or by sudden changes in the speed. Improvised stakes, sideboards and guard rails often fail, and men may plunge to the roadway and sustain serious or fatal injuries.

Adjustable tow bars are usually safer than cables for towing trucks and are recommended for this service. If cables are used, they should be in good condition and of sufficient size and length. If the cable is too short, clearance between the vehicles may be too small to permit a worker to escape in an emergency.

A tire safety rack or cage or similar device for protection against locking rings which may fly off while tires are being inflated should be provided.

These devices, along with truck parts which are vtial to safety, should be kept in first-class condition. Accidents that are fatal, especially to drivers, are often due to defective brakes, steering mechanisms, and drive shafts.

Suitable goggles should be furnished. All employees should be trained to wear safety shoes.

These Practices Are Fundamental

Most of the accidents that happen in connection with truck operation are due to unsafe practices and procedures on the part of drivers, repairmen, and other workers. The safety department has the primary responsibility for developing the safest and most suitable practices and methods in cooperation with the operating organization. After these techniques have been approved by management and taught to employees, the supervisors should be responsible for enforcing them as standard practice.

Many detailed rules and instructions can be prepared, but the circumstances and causes of most accidents show that prevention is largely a matter of observing a few safety principles.

"Keep clear of moving parts or moving equipment." This is a fundamental principle. It applies to all employees. Drivers, spotters, dump men and others may be struck by chunks falling from loads. A rock falling from the dipper onto a tire may fly 20 ft.

The driver of a truck that is without cab or canopy can avoid the hazard during loading that this entails by getting off and walking a safe distance away. The same hazard exists for the dump man while he is directing the unloading of the truck. He avoids it by standing a safe distance from the truck.

"Keeping clear" also applies to employees whose duties take them around the shovel, on roadways, or wherever trucks operate. Walking immediately in front of a truck that is about to start or already in motion, or directly behind a backing truck, instead of allowing ample room, has been fatal at times.

On the other hand, the driver is responsible for warning employees out of the way by sounding his horn. A good practice is to use two short blasts to signal "going ahead" and three for "backing."

Occasionally repairmen find it necessary to inspect parts, such as the drive shaft or power take-off mechanism, while these are in motion. Such inspections should be made only when the man is a safe distance from the equipment. There is always the danger of catching one's clothes in moving parts.

This procedure is one of the few exceptions to the fundamental rule that power should be shut off before checking, adjusting, oiling or doing any work near moving parts of equipment. Accidents arising from the ignorance and violation of this safety principle are so numerous and serious that it should be especially emphasized in safety training.

During wet or freezing and thawing weather, to avoid serious accidents drivers must stay a safe distance from the crest of the dump when unloading side- or end-dump trucks. In general the driver of a side-dump truck can watch the space between his truck and the crest closely from his seat. When the truck is an end-dump unit he must follow the directions of the dump man exactly.

If loads are dumped near the crest and then leveled by a bulldozer, the possibility of misjudging safe distances is much reduced.

Avoid Sudden Movement

Another important safety principle is that sudden or unexpected movement of a truck must be avoided when doing such jobs as coupling and uncoupling a towed truck, unloading materials, and transporting men.

(Continued on page 119)

100% SAFETY GOGGLE PROGRAM is being discussed here by G. E. LeVeque, (left) vice president of Inter-State Iron Co., and H. W. Gillespie, formerly personnel director of the company, and now assistant superintendent.

Inter-State Iron Co.'s Sight Screening Program strives for:

1. Visual Health of Employees.

H. W. GILLESPIE,
Assistant Superintendent,
Inter-State Iron Co.,
Virginia, Minn.

IN 1949, THE INTER-STATE Iron Co. began a vision improvement and eye protection program to obtain greater working efficiency and eliminate eye injuries.

Although most people know good vision is necessary for efficient and safe production, many companies still overlook visual health of employees.

Even in those companies where a pre-employment vision check is made, it is usually limited to testing acuity on a wall chart for distance vision. This is definitely insufficient for there is little relationship between distance visual ability and near visual ability, which in many occupations is the most important skill needed. Acuity is only one of the factors that should be tested. Depending upon the occupation and the industry, eye muscle balance, depth perception ability, and possibly color perception should also be checked to determine if the individual needs a complete professional examination.

Several screening instruments have been developed to test the above functions, and to test them rapidly and accurately under practical industrial conditions. After screening tests, any referral decisions should be made by the company medical doctor or professional vision specialists. However, operation of the instruments themselves can be handled by trained technicians.

One of these instruments is the American Optical Co.'s Sight-Screener, which with accessories and visual consulting services is leased to industrial companies. The instrument is portable, yet maintains standardized testing conditions, which, of course, is an advantage for many companies which have scattered plants or scattered departments within the plant.

Our objectives were to reduce eye injuries and to bring about better working efficiency through improved vision. Steps in our program were:

1. Check the vision of all mine employees on the instrument.

2. Help those needing complete eye examinations to get the proper treatment.

3. Where the type of occupation will permit, have those employees in need of glasses get safety spectacles with the correction ground into the safety glass.

4. Achieve a 100% eye protection program for all with the cooperation of the employees.

SIGHT-SCREENER (above) is used on all employees to check for distance acuity, near acuity, depth perception, and binocular coordination—a much more advanced technique than resorting solely to the conventional wall chart.

2. 100% Use of Safety Goggles.

Definite benefits result from this type program. However, certain personnel problems must be carefully considered and handled if the program is to be successful.

The hardest problem is to keep a regular flow of employees without interrupting production. Cooperation and help of the supervisory staff did much in overcoming these difficulties. Through their efforts, each mine was Sight-Screened by departments. First, surface and shop crews were screened, then personnel from the washing plant, and last, pit personnel. The last few men to be screened are invariably key production personnel. Usually these men are taken by appointment. It takes about six minutes to screen each man.

For cases of illiteracy, the Sight-Screener is equipped with a different type target. The greatest problem in screening the illiterate is getting him to feel at ease and to understand the reason for the vision test. To spare the illiterate embarrassment, we found it wise not to have other employees present while he is being screened. With patience, clear instructions, and a sympathetic attitude on the part of the operator, results are reasonably accurate.

Handling Complaints

As might be expected, even with the most diligent goggle program, complaints do arise. Many of the complaints are legitimate and arise mostly from the borderline cases involving visual deficiencies. The most common complaint among this group is headache and a burning sensation of the eyes. This can be corrected by referral to a visual care specialist and by changing from plano glasses to prescription glasses. The use of a plano lens in front of a deficient eye, even though the deficiency is not major or may be unrecognized by the individual, in many cases, will bring on headaches and visual fatigue.

There are also those complaints which have no real basis; these, for the most part, are psychological. The employee has a preconceived resistance to the idea of wearing safety glasses, and to assert this notion he develops a line of complaint. He may complain of headaches, eye burning and "drawing," or that the glasses irritate him at points of contact to the face. By referring to the Sight-Screening card, it can be ascertained whether the employee warrants further eye examination.

If no correction is necessary, we try to educate the employee on the value of wearing his safety glasses. He must be taught to discard his preconceived ideas. This, of course, is the most difficult part of the

program to achieve. We have attempted through an intensive poster campaign and through the medium of our safety page in "Men & Steel," our monthly corporation magazine, to reach and teach the employee the value of wearing safety glasses.

Through foremen's safety meetings, held monthly, we have enlisted the cooperation and understanding of the foremen in assuring an effective 100% safety goggle program.

Among certain of the employees there was a degree of apprehension. Mostly this was due to a fear of job insecurity should the employee not meet the minimum vision standards. To overcome any fear on the part of the employee, we found it desirable to explain briefly that we were present to aid in protecting and correcting their vision. We also explained that Sight-Screening did not constitute an eye examination, merely a visual check to determine whether an eye examination would be desirable. We also made it clear that we, as operators, did not interpret the information acquired from the Sight-Screening; we merely recorded the results of the screening. Interpretation of the information is left strictly to an ophthalmologist.

Information acquired by Sight-Screening is recorded on a Sight-Screener record card. We maintain our records by filing them in the individual employee's file. Any questions involving an employee's eyesight can be checked immediately by referring to his Sight-Screener record card.

Results of Sight Screening

The following is a breakdown of the 765 employees that were Sight-Screened:

Total not wearing glasses who passed the Sight-Screener test	280
Total wearing glasses who passed the Sight-Screener test	114
Total not wearing glasses who did not pass the Sight-Screener test	193
Total wearing glasses who did not pass the Sight-Screener test	178

Before discussing these totals, it would be best to review the vision tests afforded by use of the Sight-Screener. A four-point check on vision is provided with the instrument:

1. Distance Acuity—The ability to focus and see clearly with both eyes (and with each eye separately) for a distance of 20 ft. or more.

2. Near Acuity—The ability to focus and see clearly with both eyes (and with each eye separately) at a distance of 14 in.

3. Depth Perception—The ability to judge space relationship. **This is important for accuracy in almost any job and essential to safety around dangerous machinery.**

4. Binocular Coordination—The ability to make the two eyes work well together. Without this, vision is likely to be inaccurate and places unnecessary burden on the eyes.

In addition, color discrimination or the ability to detect difference in color is tested by standard pseudoisochromatic color plates.

48.6% Had Difficulty

The totals listed above deserve attention. It will be noted that 394 employees checked through satisfactorily on the Sight-Screener test, while 371 employees or 48.6% were revealed to have some type of visual difficulty. Of these 371 employees, 178 were in need of some change in their present glasses. This indicates that there are a surprising number of people who are not aware that their glasses need changing, as their eyesight declines over a period of time.

Most of these 178 employees were in the older age group. One instance was pathetically outstanding. An elderly employee had been wearing glasses for 12 years that at present were no better to him than the use of his eyes without glasses, and his eyesight was very poor. The situation was remedied in this case by a new prescription in a new pair of safety glasses. He had not been wearing safety glasses during his Sight-Screener test. The new glasses revealed a new world to this man and made it possible for him to work at his job more safely and efficiently.

The other portion of the 371 employees who did not pass the Sight-Screener test were those who had never worn corrective glasses before, or a total of 193. Nearly all of these employees are now wearing corrective safety goggles. Thus the Sight-Screener testing program certainly has reduced potential accidents that could be caused by defective vision of employees.

"Employees Were Not Aware"

Many of these employees were not aware that they were in need of some type of visual correction. In one instance, through Sight-Screening, a contributing cause for one of our serious lost time accidents was uncovered. A truck was involved in a collision which resulted in the loss of an employee's leg. The accident was attributed to weather conditions and poor visibility. Not until our Sight-Screener program did we discover that the driver was in need of corrective glasses. His depth perception was negative and his distance acuity poor. He was able to meet visual standards for the Snellen acuity test used in pre-employment physical examination. His vision was very likely a contributing factor to the unfortunate accident.

Since the start of our 100% safety goggle program there has been no lost time or disabling eye injuries. The safety goggle program has become a main part of our general safety program. It serves four main purposes. Primary purpose is the protection of employees' eyes from the many hazards which exist in a mining operation. Secondly, through visual correction, accident hazards are reduced. In conjunction with reduction of hazards because of improved vision goes increased job efficiency. Another benefit resulting from the Sight-Screening and goggle program, is the fact that it affords a personal safety contact with every man on the job—another direct aid to general safety programs.

Approximately one-third of our employees have been fitted with prescription safety glasses. This is certainly a big step in accident prevention. There is no way to estimate how many potential accidents have been avoided, but it seems evident that over a period of two years, many minor accidents and undoubtedly a number of major accidents have been prevented through visual correction.

MARKETS—Trends and Prices (Continued from page 69)

U.S. Tungsten Output Expanding

Domestic production of tungsten concentrates increased from 1,558 short tons (basis 60% WO_3) in the third quarter of 1951 to 1,706 tons in the fourth quarter, the Bureau of Mines reports. U.S. output totaled 6,167 tons in 1951, which compares with 4,244 tons in 1950 and 3,043 tons in 1949.

Salient statistics of tungsten ore and concentrates, compiled on a quarterly basis for the years 1947 to 1951, inclusive:

	Production	Shipments from Mines	Imports for Consumption	Consumption	Industry Stocks End of Period: Consumers and Dealers	Domestic Producers	Total
		Average Quarterly					
1947	795	774	1,581	2,052	3,513	387	3,900
1948	1,060	1,008	1,983	2,326	5,553	592	6,145
1949	761	691	1,648	1,303	4,444	869	5,313
1950	1,061	1,231	4,138	1,733	5,204	263	5,467
		Quarterly					
1951:							
First quarter	1,403	1,306	436	3,318	4,379	375	4,754
Second quarter	1,500	1,656	1,033	3,332	4,337	220	4,557
Third quarter	1,558	1,598	1,876	2,785	3,452	185	3,637
Fourth quarter	1,706	1,667	3,392	2,554	4,242	230	4,472

Official London Prices

Consumers in the United Kingdom obtain copper, lead and zinc at prices named by the British Ministry of Metals. Delivered prices in effect as March ended were as follows:

	Per Long Ton £	s.	d.
COPPER:			
Electrolytic, high conductivity	227	0	0
Fire refined, high conductivity	227	0	0
Fire refined, high grade	226	10	0
Fire refined, min. 99.7 percent	226	0	0
Fire refined, min. 99.2 percent	225	10	0
LEAD:			
Soft, foreign duty paid	163	0	0
Soft, Empire	163	0	0
English, refined	164	10	0
ZINC:			
Foreign (G.o.b.) duty paid	190	0	0
Domestic (G.o.b.) duty paid	190	0	0
Prime Western and debased	190	0	0
Refined and electrolytic	194	0	0
Minimum 99.99 percent	196	0	0

Miscellaneous Metals, Ores, Minerals

Quotations cover wholesale lots, prompt shipment, f.o.b. New York unless otherwise stated

MISCELLANEOUS METALS

March 31, 1952

Aluminum, ingot, 99 plus percent, lb. (base price)	19c.
Antimony, spot, lb., 5 tons and up but less than carload, in cases	53.35c.
Bismuth, ton lots, lb.	$2.25
Cadmium, commercial sticks, delivered, lb.	$2.55
Calcium, lb., ton lots, 98 percent, cast	$2.05
Chromium, 97 percent grade, lb., contract	$1.07
Cobalt, 97 to 99 percent, per lb.	$2.40
Indium, troy oz.	$2.25
Nickel, cathodes, lb., f.o.b. Port Colborne (a)	56½c.
Magnesium, 99.8 percent, carloads, lb., producer's plant, Freeport, Texas	24½c.
Palladium, troy oz.	$24.00
Platinum (Official quotation wholesale lots) troy oz.	$90.00
Quicksilver, flask of 76 lbs., 25 flasks or more	$207 @ $210
Selenium, 99.5 percent, lb.	$3.00 @ $3.50
Silicon, minimum 97 percent, carloads, lb.	20c.
Tellurium, lb.	$1.75
Thallium, 100 lb. or more, lb.	$12.50
Titanium, 99.3 percent, lb.	$5.00

(a) Includes U. S. duty.

METALLIC ORES

Berryllium Ore, imported, 10% BeO, per unit	$36.50
Chrome Ore, per long ton, f.o.b. cars Atl. ports, dry	
44% Cr_2O_3 no ratio	$27.00 @ $28.00
48% Cr_2O_3, 3 to 1 ratio	$45.00 @ $55.00
Iron Ore, Lake Superior, Lower Lake ports, long ton:	
Old Range bessemer	$8.70
Mesabi bessemer	$8.45
Mesabi, non-bessemer	$8.30
Lead (Galena), 80 percent, Joplin, Mo., ton	$245.95
Manganese Ore—Per long ton unit of Mn basis 48 percent manganese, nearby positions, subject to premiums and penalties, $1.22 @ $1.27, c.i.f. U. S. ports, duty extra. Long-term contract nominal at 90c. to 95c., c.i.f., duty extra.	
Molybdenum Ore, 90%, per lb. of MoS_2 f.o.b. mines	60c.
Tantalite, 60% concentrate, per lb.	$2.00 @ $2.25
Tungsten Ore, per unit of WO_3	
Foreign, 60 percent, U. S., equivalent, duty extra	(a) $60.00
Domestic, scheelite, 60 percent f.o.b. mine	$65.00
Vanadium Ore, per lb. of contained V_2O_5 f.o.b. mines	31c.
Zinc Ore, Prime, 60 percent concentrate, Joplin, Mo., per ton	$135.00

(a) F.o.b. port of shipment.

METALLIC COMPOUNDS

Arsenious Oxide (arsenic trioxide) lb., in bbl. carload lots delivered	6½c.
Cobalt Oxide, 72½ to 73½%, ceramic grade, per lb.	$1.82 @ $1.84½
Copper Sulphate, 100 lb.	$8.95 @ $9.95

ALLOYS

Beryllium Copper, 4 percent Be, per lb. of alloy, 5 lb. ingot	$1.56
Ferrochrome, 65 to 69 percent, per lb. of Cr contained	21¾c.
Ferromanganese, 78 to 82 percent, gross ton, seaboard	$185.00
Ferromolybdenum, 55 to 65 percent Mo, lb. of Mo. contained	$1.32
Ferrosilicon, 50 percent, per lb. of contained Si	12.4c.
Ferrotungsten, 75 to 80 percent, lb. of W contained	$5.00
Ferrovanadium, per lb. of V delivered	$3.00 @ $3.25
Silicomanganese, Max. 1½ percent carbon, per lb. contracts	9.9c.
Spiegeleisen, per long ton, 19 @ 21 percent grade	$75.00

NON-METALLIC MINERALS

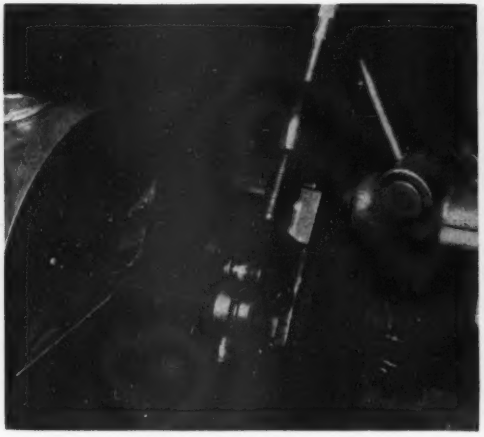
Asbestos, f.o.b. Canada (Quebec) mines (U. S. funds), ton:	
Crude No. 1	$960 @ $1,500
Crude No. 2	$595 @ $900
Spinning fibers	$275 @ $475
Shingle fibers	$123 @ $170
Paper stock	$85 @ $119
Waste	$63 @ $70
Shorts	$30 @ $63
Asbestos, Vermont, f.o.b. Hyde Park:	
Spinning fibers	$279.50 @ $302.00
Shingle stock	$135.00 @ $162.00
Paper stock	$81.50 @ $115.00
Waste, stucco or plaster	$71.40
Refuse or shorts	$34.00 @ $63.00
Barytes, f.o.b. mines:	
Georgia, crude, per long ton	$13.00 @ $13.50
Missouri, 93 to 94 percent $BaSO_3$, per short ton	$10.15 @ $10.40
Bauxite, long ton, f.o.b. point of shipment:	
Domestic, crude, 50 to 52 percent (not dried)	(a) $4.50 @ $5.50
Domestic, chemical, 55 to 58 percent	(a) $8.50 @ $9.50
Domestic, abrasive, 80 to 84 percent	(a) $18.00 @ $18.50
China Clay, f.o.b. mines, ton:	
Georgia, filler and ceramic grades	$8.50 @ $9.50
North Carolina ceramic grade	$20.25 @ $22.25
Feldspar, bulk ton:	
Potash or soda feldspar, 200 mesh, ceramic grade	$18.50 @ $22.25
Glass feldspar, white, 20 mesh	$11.75 @ $12.50
Fluorspar, f.o.b. mines, bulk, Kentucky and Illinois, 70% effective, CaF_2, ton	$43.00
Acid 97% concentrate, bulk, ton	$60.00 @ $65.00
Fuller's earth, f.o.b. Georgia or Florida, ton	$7.00 @ $14.00
Magnesite, per ton dead-burned, bulk, f.o.b. Washington	$36.30
Mica—Domestic, f.o.b. mines. Punch 12 to 22c. per lb. according to size and quality. Sheet, clear, 1½ x 2 inch, 80 to 85c.; 2 x 2 inch, $1.10 to $1.20; 2 x 3 inch, $1.50 @ $1.60; 3 x 3 inch, $1.80 @ $1.90; 3 x 4 inch, $2.20; 3 x 5 inch, $2.40; 4 x 6 inch, $3.15; 6 x 8 inch, $4.25. Wet ground, very fine, $140 @ $155 per ton. Bulk sales, dry ground: $32.50 @ $70.00 per ton. Scrap, $32 and up.	
Ocher, Georgia, ton, in sacks	$26.25
Pyrites, Spanish, per long ton unit of S, c.i.f. Atlantic ports	Not quoted
Sulphur, Texas, mines, long ton	$22.00
Talc, f.o.b. works, ton:	
New York, purified	$18.50 @ $20.00
Vermont, extra white	$12.50
Tripoli, Missouri, ton:	
40 mesh, cream colored	$30.00

(a) Nominal.

IRON AND STEEL

Pig iron, gross ton, basic, Valley furnaces	$52.00
Steel, f.o.b., Pittsburgh billets, net ton	$56.00
Structural shapes, 100 lb.	$3.65

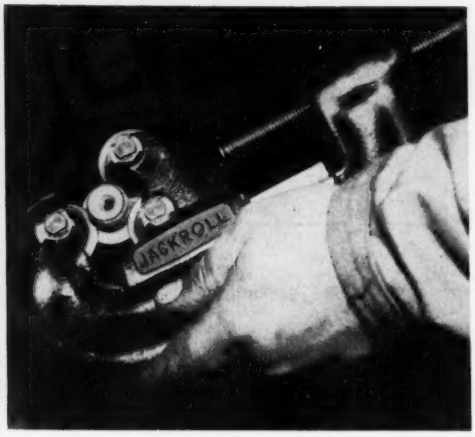
KEEPING TAB ON PRACTICE



OPERATION NO. 1

BY MACHINE—(Before treatment)

1. Complete all machining operations except threading.
2. Put Jackroll tool in place on rod with the three rollers in the rod undercut. Be sure that flat side of rollers is against rod shoulder.
3. Bring all three rollers into contact with undercut by means of the adjusting screw.
4. Tighten adjusting screw a quarter turn.
5. Rest Jackroll body on front side of carriage of lathe or Toledo threader.
6. Start the machine, using threading speed and rotation.
7. Let rod rotate in Jackroll three to six turns.
8. Remove Jackroll and put thread on in the usual manner.



OPERATION NO. 2

BY HAND—(After treatment)

1. Place the rod in a vise in a manner to leave room for completely revolving the Jackroll.
2. Place Jackroll on the rod with the rollers in the undercut. Use care not to drag rollers over the finished thread.
3. Tighten the adjusting screw until all three rollers are firmly seated in the undercut.
4. Tighten adjusting screw a quarter turn.
5. Revolve the Jackroll around rod two or three times. *Do not again tighten adjusting screw.*
6. Remove Jackroll from rod.
7. After rolling, check the thread with the "Go Thread" ring gage to make sure it goes against the shoulder.

Rolling Undercut of Hollow Alloy Drill Rod Reduces Breakage at this Critical Point

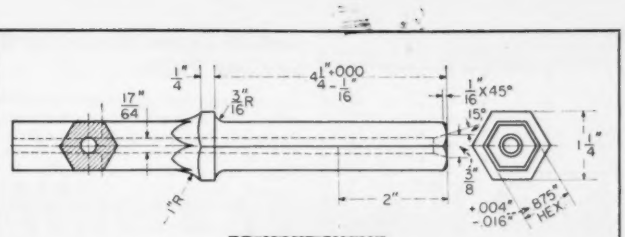
New tool for strengthening undercut by putting it into compression, and new forging procedure have been developed to improve rod performance.

A SPECIAL PRE-STRESSING operation at the undercut of its Series 100 alloy steel Jackrods and a new forging procedure for a simplified pear-shaped shank have been developed by Ingersoll-Rand's engineering and metallurgical departments to eliminate the two major sources of trouble had with the rods. These were: rod failure, mostly at the undercut, and difficulties in shanking the alloy steel.

It was in December, 1949, that this manufacturer introduced the 100 Series shoulder-drive connections for use with its tungsten-carbide (Carset) bits. Only recently have the efforts to provide a hollow alloy drill rod that gives better performance than carbon steel attained their objective. It has been found that resistance of the Series 100 rods to breakage through the undercut can be increased remarkably by the pre-stressing produced by rolling the undercut. This operation conforms to accepted metallurgical principles.

The rolling operation leaves a residual compressive stress in the

NEW TOOL for rolling the undercut.



TO MAKE SHANK

1. Forging temperature, 2025 deg. F.
2. Plunger stroke (of sharpener), 11/16 in.
3. Do not punch or swage shank.
4. Grind off parting line flash that interferes with gage.
5. A ¼-in. diameter rod must enter water-tube hole 2 in.
6. Grind 1/16 in. x 45 deg. chamfer on end of shank.
7. Flare water-tube hole and square end with shank grinder.

UNDERCUT is at base of thread adjacent to the shoulder.

surface layers of the undercut. The tension stresses normally produced in service must overcome these compression stresses before the undercut can be loaded in tension. The tension values, therefore, cannot rise to as high a value. The lower level of these stresses results in longer life of the drill rod.

The work carried out to date on this new method of shanking and rolling of the undercut has been most successful on Crucible Steel's "chrome-moly" alloy drill steel, known as the "CA" Double Diamond, and should be equally successful on other alloy steels. Recommendations as to the best way of annealing and heat-treating this brand of alloy steel have also been made.

Any of the three Series—112, 113 or 115, can be rolled on any type of steel with the one set of wheels regularly furnished. The operation is performed once before heat treatment, to preform the undercut and provide a smooth finish, and after heat-treatment to accomplish the real purpose of rolling, which is to strengthen the undercut.

Undercut rolling with the Jackroll can be readily accomplished by hand operation similar to that involved in using a pipe cutter. In the annealed condition the inside thread can be easily distorted by the roll, and for this reason the first operation is done in the lathe or Toledo threader after turning and forming but before threading. The second operation—after heat-treatment—is always done "by hand."

"Single-Use" Bits Re-used in South Africa

THE LIGHT SINGLE-PASS STEEL BIT extensively used in South Africa's mines is no longer altogether a single-use bit, according to a report from Johannesburg. A third or more of those put into service are being repressed to give another usage. The over-all number of bits consumed has decreased to about 56 million in 1951, a decline of 22% from the 1950 figure, due to wider adoption of carbide-tipped jumpers. The latter have shown an all-around increase. The Rand Mines group used 120,000 jumpers in 1951, compared with 58,000 in 1950. Other groups have probably doubled their consumption.

Detachable carbide bits are still used mainly in shaft-sinking.

Use of mechanical loaders underground in South Africa has increased steadily since 1946-47 when the Eimco rocker shovel was used in establishing an advance of 1137 ft. per month in the 12 x 12-ft. haulageway at the Grootvlei mine. There are now 300 in service.

The general trend in transport is toward the use of larger and more efficient cars. In the past, the 20-cu. ft. or 1-ton car had been used to a great extent. The new mines are being laid out for 4- to 10-ton cars, employing automatic tipping devices to reduce labor requirements. Examples are the Granby-type car and Cargill drop-bottom car.

Another development has been the extensive and successful use of diesel locomotives underground. They are cheap in respect to initial installation and capital outlay. This is encouraging the more extensive use of locomotives for haulage purposes underground.

New Piercing Rig Reaches Reserve's Taconite Pit

THE JPM-3 JET-PIERCING MACHINE built for Reserve Mining Co. by Linde Air Products Co. is now at the former's taconite pit at Babbitt, Minn. In operation it is similar to the JPM-1. Its mast, 64 ft. high, will handle a blowpipe that will pierce 7½-in. holes as deep as 47 ft., permitting blasting on 40-ft. benches.

Blowpipe advance is controlled automatically. This is expected to increase the piercing rate. Use of 125 psi operating gas pressure, as compared with 200 psi on the JPM-1 machine, will make it possible to employ low-pressure oxygen.

Other features include semi-automatic ignition, air-actuated steering for locating the machine precisely, and a sealed cab for operator comfort. The machine will weigh about 40 tons.

Drilling and Blasting Practice Advancing at Rhokana

CARBIDE-TIPPED FORGED STEEL has been in use for 12 months in 1951 throughout the Rhokana Corporation's mine, in Northern Rhodesia. H. E. Nelems, acting general manager, points out the following less obvious advantages of this drilling medium:

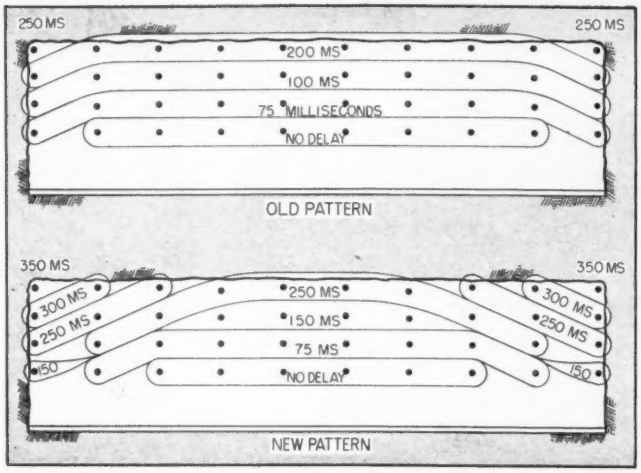
Consumption of straight carbon steel averaged 60,000 lb. before carbide-tipped steel was introduced. It now averages 3,000 lb.

The number of jackhammers and stopers in use has decreased by 30%, although jackhammers have replaced stopers in all development work, except current experimental work.

Since June, 1951, the standard carbide-tipped steel has been gradually replaced by an improved tipped steel, resulting in an increased life of 500 to 1000 ft.

Long blast-hole drilling with coupled rods and carbide bits is being experimented with. Drilling of holes varying from horizontal to vertical position has proved reasonably successful. However, desludging of down holes has proved difficult and no entirely satisfactory method has yet been devised. Tests are continuing.

In blasting, the introduction of millisecond delay detonators, reported last year, has proved so successful that use of this type of deto-



THE DRILL-ROUND PATTERN has been changed at International Minerals & Chemical Corp.'s potash mine, Carlsbad, N. M., as shown here. (See also *E.&M.J.*, Feb., 1952, p. 120.) The new pattern gives a looser muckpile, increases blasting efficiency, and cuts maintenance of loading machine.

nator is now standard practice throughout the mine. Early claims of greatly improved fragmentation have been fully justified. Prior to this introduction of milli-second delay detonators and blasting of holes of larger diameter, an average of 125 tons per case of explosives was obtained in secondary blasting, compared with the present figure of 270 tons per 50-lb. case. The decreased effect of concussion on the hanging wall has been most marked.

Practice Shorts

Automatic controls are slowly finding wider use in pumping in metal mines. M. A. Hanna Co. has provided

(*Continued from p 81*)

only, in place of the 3½ shifts per day formerly required.

Particular effort has been made toward insulating trunk and branch steam and hot water lines as well as ceilings and other points of exposure.

Floor radiators have been replaced wherever possible, with circulating type heaters and thermostatic control. The mill heating plant has been eliminated entirely and heat is now furnished from the central plant. The saw-mill heating plant now utilizes sawdust and hog fuel from the saw mill, framing and carpenter shops for fuel. The excess steam from this source supplements that made by the hotel heating plant for heating the hotel and apartment house.

automatic features on deep-well and centrifugal pumps used in dewatering at an unused shaft at one of its iron mines on the Menominee Range. Also, a deep-well pump handling 300 gpm at 600-ft. head installed on the 19th level of one mine is equipped for automatic operation. . . . **Corrosion-resistant stainless steel** is used in some pumps and on cage doors and bonnets in some of Hanna's Michigan mines where acid-water conditions prevail. . . . **Abrasion-resistant high-carbon steel** is being used in skip pockets. . . . **Mine lighting** consists in the not-uncommon practice of lighting main levels and scraper drifts throughout the mine with dc current taken from the trolley haulage system. Several four-cell Edison cap lamps have been purchased. . . . **Underground crushing** at Hanna's Michigan mines is undergoing a change through replacement of gyratories by jaw crushers. In two mines 30 x 42-in. Blake-type machines have been installed.

In blasting, McIntyre Porcupine Mines, at Schumacher, Ont., is using Igniter cord or Thermalite type B in subdrifts driven from raises. It is said to cost much less than electric blasting. Crews are easily trained in its use. The most important point, according to the management, is to make certain to crimp the Igniter cord in the connector so that the contact has been made. Experimentation under way may develop other applications for the cord.

Question. In operating a dual-wheel truck, a mining company was reported some time ago to be hanging a bar between the dual wheels to remove rocks that tended to accumulate there. The company's name will be appreciated.

Carbide-Tipped Steel Gaining in Kolar Field

LARGE-SCALE USE of tungsten-carbide drills over the past two years at the Champion Reef-Ooregum Joint Operation in the Kolar goldfield, South India, has resulted in greatly increased development footages and substantial economy in costs, according to John Taylor & Sons, Ltd. Use of carbide-tipped steel will probably prove more satisfactory than carbide-insert detachable bits for local conditions.

At Nundydroog Mines (KGF) Ltd., also operated by John Taylor & Sons, the use of airlegs and tungsten-carbide bits has been further extended. All development and 25% of stoping are being carried out with this equipment. Since its introduction two years ago, 250,000 ft. of holes has been drilled with 2,300 detachable bits. Subsequently, detachable bits were replaced by tipped steel, 3,500 of which have drilled 600,000 ft. of hole.

The Mysore Gold Mining Co.(KGF) Ltd. tried carbide-tipped detachable bits and found them to be a big improvement on conventional steel. But the attachment gave them trouble and breakages at the tapered end were frequent. Carbide-tipped drill rods (chisel-type) are now in use in all development ends and proving satisfactory. Extension of their use to stoping is under consideration. Experimental work on re-tipping rods is in hand.

Use of airlegs has been introduced. An earlier start in drilling is possible, time required to rig the bar being eliminated.

Special Field Developing for Long-Hole Rock Drilling

LONG-HOLE DRILLING with tungsten-carbide bits and sectional steel has made great strides recently, in the opinion of George Doner, Chicago Pneumatic's rock-drill sales manager. However, comparatively little of this increase has been at the expense of blast-hole diamond drilling. Percussion long-hole drilling is apparently developing its own field, in which the holes on the average are considerably shorter than when the diamond drill is used. It is much more successful in up-hole drilling than in down-hole work.

Mr. Doner also holds that in the trend to single-use steel bits and tungsten-carbide bits the latter has recently gained more, percentagewise, than the single-use bit. However, due to short supply and slow deliveries, the choice has often been governed by availability. Until recently, the carbide-tipped forged rod was used mainly with the airleg type of mounting, but the past year saw the carbide-tipped rod and the detachable carbide bit invading each other's field to some extent.

Where you will find THE REAL REVOLUTION

"If we keep in mind the values of opportunity, competition, democracy, productivity, then it is our capitalist society which is the truly revolutionary one – the only society which offers true hope to the masses for release from the long nightmares of tyranny. It is we, not the Marxists with their reactionary ideas of the good dictator, who have the truly constructive, the truly revolutionary ideal."

– from "Capitalism" by David McCord Wright.

If we can only win recognition of this truth, we shall win the struggle of free men against communism. This editorial discusses some of the hurdles that must be cleared.

To win the needed recognition that "our capitalistic society... is the truly revolutionary one," we must keep pounding away both abroad and at home. That is because the communists simultaneously attack us on an international front and try to undermine us from within.

The present drive to rearm ourselves and our allies is crucial to our self-protection on the international front. We must be prepared to meet the armed force of aggressive communism with armed force if we are to secure our physical freedom.

Arms are not enough

But to re-establish parity in arms is only half of the battle. In the last analysis it is not the more important half. To be effective, our arms must be backed by loyalty of men to our ideals. So, both abroad and at home, we must win men to the faith that we do have "the truly constructive, the truly revolutionary ideal."

On the international front, the effort to win adherence to such faith in our capitalist society meets tough going. That arises from the fact that in some of the countries that are allied with us in the fight against communism, capitalist society has offered to its people no such ideal. In varying degrees "the values of opportunity, competition, democracy, productivity" – those key aspects of American capitalism – are either absent or subordinated in their economic life. Indeed, the *Wall Street Journal* recently remarked that "to the European, capitalism has become synonymous with cartels – and with the disregard cartels foster for the consumer, the worker and the over-all well-being of the nation's economy."

No Simple Solution

Nonetheless, many European labor and governmental leaders sincerely believe that cartels are essential to their economic salvation. They believe that without such restrictions in congested European markets there would be intolerable cut-throat competition and instability of employment. Thus, when we point out that the cartel capitalism so prevalent in Europe lacks the constructive qualities of competitive American capitalism, we may offend European leaders whose wholehearted cooperation we need in the fight against communism.

But, if we soft-pedal that contrast, we sacrifice the opportunity to win understanding and loyalty from millions of Europeans who have had no chance to learn that capitalism can be the constructive and liberalizing force that it is in the United States. Indeed, when many of these millions embrace socialism it is not because they love it. They are rather desperately seeking a tolerable middle course between what they consider the hateful extremes of communism and the undesirable aspects of capitalism as they understand it.

New name not the answer

We know that there is no easy way to handle the problems created by such misunderstanding of American capitalism. Neither do we share the belief that much of the difficulty would be overcome if we were to call American capitalism by some other name. By doing that, the argument runs, we shall relieve it from the unpleasant connotations that are attached to the word capitalism in some other parts of the world. But, after all, if we are to give up all the terms that have come to mean something else in other parts of the world, we must begin by ditching the term "democracy" which, in the official jargon of the Kremlin, seems to mean what we call dictatorship.

In spite of the difficulties, however, we must stick to this job of exporting the truth that our capitalist system does offer opportunity, competition and democracy. We must let the rest of the world see that it means a continuous drive for increased productivity, and the search for profits by increasing sales and consumption, not by trying to sell less for more.

Export alone not enough

The spreading of truth about American capitalism will not be effective if it is merely directed abroad. Unless it is carried on at home also, it will lack the driving faith that is essential to any convincing export of this type. Nor will export alone come to grips with the communist attack on our country from within—an attack that gets too much help from loyal Americans who short-sightedly repudiate the basic principles of our institutions in their efforts to reform some of their deficiencies. For success both at home and abroad, we must have right here at home a much more militant recognition that it is in fact our capitalist society which offers "the truly constructive, the truly revolutionary ideal."

Here at home, too, this raises difficult complications. Businessmen who are among the leaders and principal practitioners of capitalism, have generally been catalogued as conservatives. Hence, many people must stretch their imaginations a bit to see that businessmen are leaders of a development which has so greatly and so rapidly improved the lot of free men in America that it is truly revolutionary.

These difficulties of definition, however, are relatively superficial aspects of the problem of seeing our capitalist society clearly. The basic facts are that:

American capitalism is leading free men to an ever higher material standard of living while respecting their spiritual, social and political freedom.

Communism is leading its people back into a life of servile regimentation under dictatorship.

American capitalism advances to high ground never before attained by free men. Communism retreats to ground that men with an appetite for freedom throughout the ages have sought to escape. If we can establish this truth firmly, around the world, we shall no longer need to worry about communism. It will be hopelessly sunk.

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WASHINGTON IMPACT

U.S. Slows Copper Substitution Drive, Keeps Tight Rein On Metal Prices

THERE'S SCANT COMFORT for the mineral trades in OPS plans to end price ceilings. That's why industry leaders are asking Congress to write a compulsory decontrol formula into the new defense production act.

OPS does have a decontrol plan. Price officials drew it up under considerable time pressure, to try to head off the proponents of a rigid formula as part of the law.

Their first standard for decontrol would bar every important metal except tin. OPS won't consider decontrolling any product which is selling at or near its 1951 high.

Its theory is simple. OPS figures any product near its 1951 high would go higher if the ceiling were taken off. And they're dead against using decontrol as an indirect way of allowing prices to go up.

Even if a price falls well below the ceiling or the 1951 high, OPS will be cautious about decontrolling. If it sees any possibility that the price drop is only temporary, it will keep the ceiling.

About the only break metals and minerals get in the OPS approach is that their prices are established in accurately-reported markets, covered by *Engineering & Mining Journal's Metal and Mineral Markets*, and others. This would make it easy for OPS to keep track of prices once ceilings are removed. Officials think this is an important qualification for decontrol, They want to be able to put ceilings quickly back into effect on any product that starts up in price.

As a matter of fact, OPS isn't considering outright decontrol. The most it will do if Congress accepts its plan, will be to suspend ceilings, keeping them in the background ready for instant use if needed to stop a price rise. In other cases, where prices seem solidly below ceilings, OPS will allow some easing of the paper work industry must keep up. But it doesn't want to kill ceilings outright on any product, no matter how far down its price may sink.

Demand Could Ease

The outlook for minerals and metals is clouded just now by the lag in arms production behind military schedules If the old schedules are torn up and thrown away, a habit with mobilizers when things go wrong, there could be quite a slackening in demand for metals.

Actual figures are classified, but there's reason to believe that production of medium and light tanks, and fighter and bomber aircraft is well behind schedule.

If the administration decides the world situation warrants hanging onto the original schedules, production will be pushed ahead later this year. That will mean full consumption by the military of all the raw materials needed to turn out 135 air groups and all the other armament planned last December when the present schedules were set up.

But if an easier world situation, and domestic politics, seem to permit it, then schedules will be recast and nothing like the predicted consumption of raw materials will take place. That would not, however, put metal and mineral markets back wholly under the influence of civilian demand. Government stockpiling will come heavily into the picture, assuming that funds are available to carry the program into the next fiscal year. Also government purchase contracts at or above the present price level will have a stabilizing influence on metal markets.

Copper Argument Ends?

On March 12, it looked as if the great copper argument had ended, with a victory for copper producers. That's when the DPA estimated that copper supply and demand would be in balance in 1955. Then the top mobilizers decided to forego a third round of aluminum expansion. It all indicated that Washington had abandoned the idea that copper would always be short and that aluminum would have to be substituted for it. But the feeling hasn't spread down all through the bureaus yet, because there are still releases and speeches coming out of Washington calling for a switch from copper to aluminum.

In announcing DPA's estimate of copper supply and demand for 1955, Jess Larson, whose agency, DMPA, really supplied the data, said that copper supply in 1955 would fall only about 3,000 tons short of demand for the year. This is the sort of statement that always gives industry members that hopeless feeling. There is no one in the copper industry who would care to give a firm guess on supply and demand figures for next month, and put it within a 3,000-ton margin, let alone do it for the whole year of 1955.

Supply from present U.S. mines is expected to climb to the million-ton mark next year, then decline to 920,000 tons by 1955.

Meanwhile, copper is still the scarcest of the major metals, in the eyes of Washington. NPA is telling industry groups that controls on steel and aluminum might be relaxed Jan. 1, 1953, but no relaxation of copper controls is in sight. Export licenses for copper are going to keep right on being hard to get.

Here's the DPA estimate of copper supply for 1955:

Short Tons Of Refined Copper By Source

	1950	1955
U.S. mines, present sources.	921,000	920,000
U.S. mines new sources ...	.....	250,000
From scrap.....	474,000	450,000
Imports	636,000	650,000
Total	2,031,000	2,270,000

A practical effect of the decision on copper is that plans for another 140,000 tons of aluminum capacity are out, at least for the present. Chief mobilizer Charles E. Wilson took a look at softening demands for metals and put plans for more aluminum expansion in mothballs.

Even the purchase of additional aluminum from Canada, long a favorite plan of DPA boss, Manly Fleischmann, is delayed. And Fleischmann has told a Congressional committee that it won't be carried out without giving Congress a chance to okay the deal. The idea was to buy 94,000 tons of Canadian aluminum in 1953, 179,000 tons in 1954, and 300,000 tons a year thereafter, through 1959. It would have gone into the U.S. stockpile, which aluminum czar, Sam Anderson, wants to see built up to 4,000,000 tons. The aluminum industry doesn't want to see it happen, or even to look at the idea very seriously. The problem is bringing the whole matter of how big stockpiles should be, and where the metal should be obtained, back into the argument stage again.

Tin Peaceful At Last

Agreement by the U.S. to buy up to 18,000 tons of tin a year over the next three years from Indonesia at $1.18 per lb. f.o.b. port of shipment, means this country's quarrel with the producers is about over. Combined with the sale of 20,000 tons to the U.S. for delivery this year under terms of the British deal, it means about two-thirds of the country's needs are now certain to be met.

The offer of $1.18 was extended to Belgian Congo producers and is likely to be accepted by them. That will leave only the Bolivians to deal with. RFC negotiators think they can make an agreement satisfactory to both

Here's the hookup for valve-killing corrosive services...

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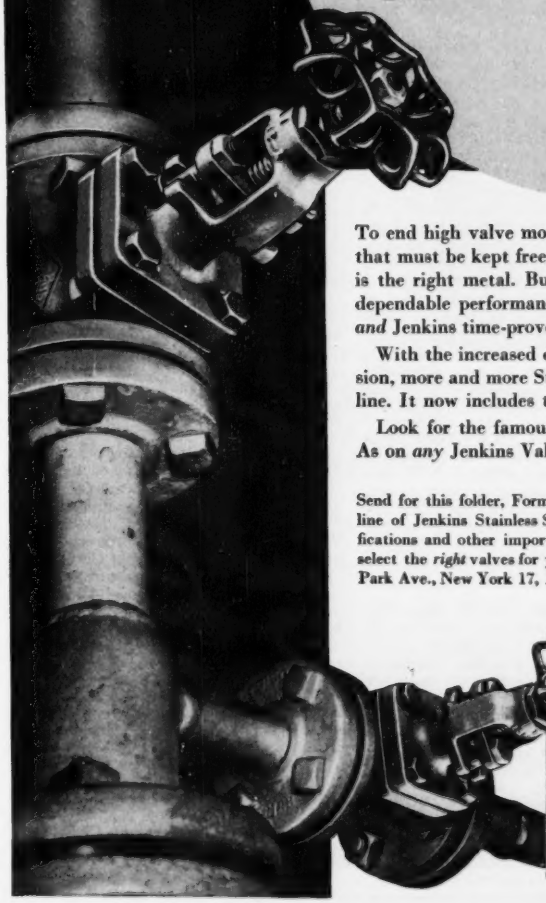

To end high valve mortality from corrosive liquids, and to control fluids that must be kept free from contamination or discoloration, stainless steel is the right metal. But it takes more than metal to make a valve. For dependable performance, you need the two-way hookup—Stainless Steel *and* Jenkins time-proved Valve Engineering.

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sides. Now that the threat of a tin dispute is ended, both the U.S. policy makers and the producers can claim victories. From the government's point of view, tin at $1.18 is certainly better than the $1.75 it was selling at when the RFC withdrew from the market. From the producers' point of view, $1.18 is better than the $1.03 RFC stubbornly clung to, until ordered by President Truman to sign with the British.

The question of blame for the rapid rise in prices, after the Korean shooting started, has not been answered. Producers argue that prices never would have gone up so far if the RFC had not bought recklessly for the U.S. stockpile. On the other hand, RFC and other government spokesmen accused producers of running up the price by means of cartel agreements. As long as the question remains unanswered, it will remain as a sore point, and a possible source of trouble in the future. Now that it can be discussed without risk of unsettling the market, or endangering U.S. supplies, it may well be raised again by some Congressional investigating committee.

U.S. Buys Mica

After a year of study and discussion, the government has finally gone into the mica-buying business. The program is similar to those for tungsten, manganese, and chrome. Prices are attractive, to say the least.

General Services Administration is establishing depots at Keene, N. H.; Spruce Pine, N. C.; and Custer, S. D., for inspection and purchase. The program will run until June 30, 1955, or until the total accepted by the government reaches the equivalent of 25,000 short tons of hand-cobbed mica, f.o.b. government depot.

Prices for processed No. 3 and larger block and film mica will be $70 per lb. for good stained or better; $18 per lb. for stained; and $13 for heavy stained. The supply of the top grade from domestic sources has been small.

No. 4 and No. 5 will bring $40 per lb. for good stained and better; $8 per lb. for stained; and $6 per lb. for heavy stained.

No. 5½ and No. 6 is priced at $15 per lb. for good stained and better; $5 per lb. for stained; and $3 per lb. for heavy stained.

GSA will not accept a shipment of less than 45 lb. of block or film mica.

The price of hand-cobbed mica accepted by GSA will be $600 per short ton. Producers must notify the receiving depots of their intention to ship, giving the quantity. Shipments of less than 1,000 lb. will not be accepted. Arrangements will be made to inspect the shipment at the point of production, provided it is within 300 miles of one of the depots. Requirements are that the hand-cobbed mica yield 4½% block or film, grade 6 or larger, and heavy stained or better quality.

LABOR THIS MONTH

Joseph M. Gambatese, McGraw-Hill Washington News Bureau

WSB STEEL DECISION: Wage increase level recommended will raise target for bargaining in nonferrous metals but not much. Mine, Mill and Smelter Workers already got part of the steel boost last year. WSB's steel increase recommendations: 12½¢ beginning last Jan. 1; 2½¢ more July 1; and another 2½¢ next Jan. 1. Cost averages 15¢ over the 18-month contract period, but leaves basic rates 17½¢ higher—near $2 an hour—in mid-1953.

Fringes: They leave something for unions with lesser benefits to shoot for, if the industry goes along. Here they are:

Holiday Pay: Double time for six holidays worked; straight pay when not worked.

Shift Differentials: Raised from 4 to 6¢ second shift; from 6 to 9¢ on third shift.

Vacations: Three weeks with pay after 15 instead of 25 years.

Sunday Pay: Beginning next Jan. 1, time and a quarter for work on Sundays as such.

Area Differentials: Southern differential cut from 10 to 5¢ an hour. Intercompany differentials subject to further negotiation.

Annual Wage: It was put off until 1953 negotiations, along with severance pay and reporting allowance. Meantime, it will be studied by a joint committee with help of a neutral party.

Package Cost: The wage increase and fringe benefits figure to cost an average of 19¢ an hour this year; next year, 6¢ more. Mine-Mill got package increases of 19 to 21¢ from copper companies last fall.

MINE-MILL DEMANDS: Delegates from Anaconda, Kennecott, Phelps-Dodge and American Smelting & Refining met in Denver right after WSB issued its recommendations in the steel dispute. Mine-Mill is out to top the steel settlement, and strike if necessary. Talk was tough.

BESSEMER CLASH: Mine-Mill licked the CIO steel workers at Republic Steel's Bessemer (Ala.) mines. After a pitched battle in which 60 gunshots were reported fired, Mine-Mill won a bargaining election, 209-195. Mine-Mill had an easier time at Kennecott's Ray-Sonora mines in Arizona, defeating the AFL machinists, 258-10.

WHITE-COLLAR DRIVE: AFL's office employees union has a new organizer in the mining country, David C. Sharman. He claims to have signed—48 hours after arrival—more than ⅔ of Kennecott's 70 office and clerical workers at Bingham Canyon. OEIU-AFL, nationally, is considered a right-wing outfit. It's headed by youngish Paul R. Hutchings.

TOBIN ON COMMIES: For one, Secretary of Labor Tobin is not echoing labor union views. While CIO and AFL oppose legislation against left-wing unions like Mine-Mill, Tobin stuck his neck out with this suggestion: NLRB should deny bargaining rights to any Communist-dominated union, just as it does to those company-dominated. Neither is a real "union," he feels.

REACTION: AFL and CIO did not react unfavorably to Tobin's proposal because it would be to their advantage. In fact, they may have suggested it themselves behind the scenes. But the Communistic *Daily Worker* took violent exception, accusing Tobin of conspiring with the U.S. Chamber of Commerce.

MINING DISPUTES AT WSB: An increasing number of mining disputes involving the CIO steel workers are finding their way to WSB with company approval. WSB recently agreed to give a binding decision in three lead and zinc mining disputes which weren't settled last year. They involve Combined Metals Reduction Co., New Park Mining Co., and U.S. Smelting, Refining and Mining Co. operations near Salt Lake City. WSB deferred accepting three similar disputes because only recommendations were being asked.

AS&R AGAIN: The first labor dispute WSB handled, referred by the White House, involved the CIO at American Smelting & Refining Co.'s smelter at Garfield, Utah. WSB has been asked to settle another dispute there involving clerical and technical employees, also in the CIO steel union. Issues: CIO demand for double time after eight hours worked on a holiday, three weeks' vacation after 15 years, and cost-of-living salary increases.

BACK PAY: Two employees at Sunset Minerals' lead and zinc operations at Kellogg, Idaho, would be reinstated with back pay under the recommendations of an NLRB trial examiner. He said they struck over unsettled grievances filed by Mine-Mill. The company disagreed, said they were fired for being absent without notice.

What's New in hydroseparators?

Newest addition to the Dorr line of hydroseparators is the Type BW — a modification of the thoroughly proven and accepted Type H introduced several years ago. It is the *economical* answer to the problem of handling granular solids which do not warrant the use of the heavier Type H — but which are too heavy for a standard unit. Here are its major features...

Power to spare when you need it . . . through the BW's heavy-duty balanced worm and spur-gear drive.

Positive overload protection . . . by means of an automatic hydraulic lifting device activated by the torsional load on the mechanism. When an overload is encountered the rakes raise quickly — then lower slowly as the overload is reduced.

Unique Center-Shaft Design . . . combining an outer drive tube to which the pivoted drive rods are hinged and an inner lift tube which carries the rake arms.

Free, center-cone discharge — entire rake and drive mechanism is supported by a truss spanning the tank. Result . . . a clear center-cone area . . . providing unimpeded discharge of heavy solids.

The Type BW is available in diameters ranging from 40 to 75 feet. We'd like to tell you how it can fit into your picture economically . . . without obligation of course.

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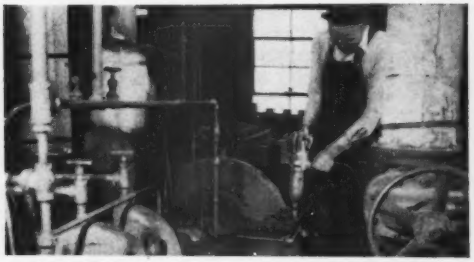


1. ANNUAL INSPECTION AND REPAIR of boiler feed pumps and turbines is big nut-and-bolt job. Casing bolts on boiler feed pump now come off in five minutes with 8U Impactool; job took 1½ hours by hand. Complete overhaul now takes 64 manhours, formerly took 96.

2. REPLACING CUTTING SHOES on cutter which breaks up aggregate from furnace grate takes 2/3 manhour, as against three manhours by hand. Conveyor plate on chute leading to this cutter is replaced in one manhour now, but took three manhours before.

3. REPAIRING INCLINED DRAG CONVEYOR requires removal of flights from chain. Entire replacement (four ½ in. bolts on and off) takes one man five minutes now, but took two men 20 minutes with hand wrenches.

4. REPLACING SCREEN JACKET ON VIBRATOR which grades the aggregate formerly took two men for two hours. Now with electric Impactool two men do the job in 20 to 25 minutes. Down-time is reduced about 80%.

5. SMALL DRILLING JOBS, like drilling this electric-conduit bracket, are done with ½ in. drill attachment on Impactool. Foreman estimates that power tools cut time in half. Since workman does job at vise on workbench, tool also frees drill press for larger jobs.

Time Studies Show Electric Tools Cut Repair Time

Time studies in these illustrations were made at Lehigh Materials Co.'s relatively new and highly mechanized "Old Company's Lelite" plant at Lansford, Pa. One of Lehigh's main problems—one that faces most continuous-flow plants—was avoiding down-time during machinery repair. Two electric Impactools recently developed by Ingersoll-Rand have cut down-time to a fraction of what it formerly was.

The prime requisite in repair work is speed. R. L. Taney, plant superintendent, and Steve Dmytrow, plant foreman, estimates that the tools cut down-time for machinery repair by as much as 75 to 85%.

Versatility is important too. Though used chiefly at the Lelite plant for nut running and removal, and for drilling steel, the electric power tools (with appropriate attachments) may also be used as reamers, tapping machines or screwdrivers.

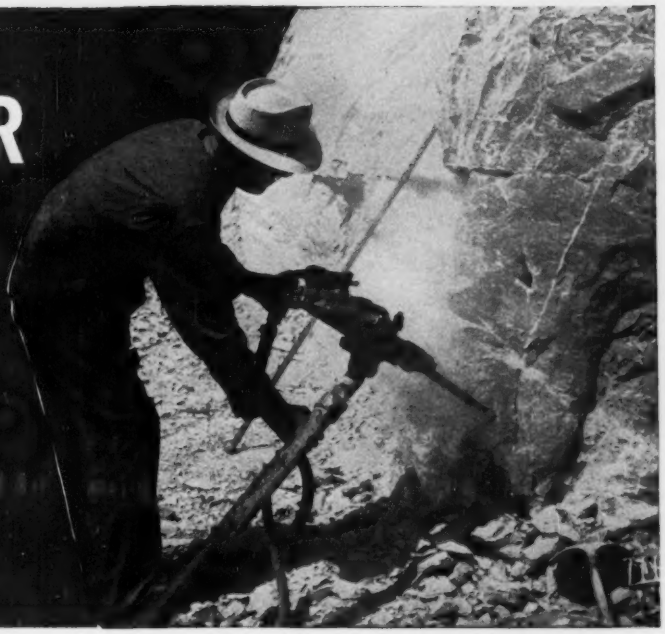
In the "Old Company's Lelite" plant, Lehigh takes refuse slate and processes it into a lightweight aggregate. The product finds a ready market as a light, strong, cheap, fire-proof aggregate for concrete.

The SINKER LEG with

EXCLUSIVE

EXCLUSIVE

EXCLUSIVE



Here's real savings in labor . . . man hours . . . and drilling costs . . . and 45% more drilling footage by actual tests!

The miner can carry the entire setup—Thor Sinker and Thor Leg—into the smallest tunnel or closest corner, set it up in an instant, start the hole . . . and then let Thor do the work! All he does is control the *constant pressure* feed by operating two simple throttles—*the only automatic controls in leg operation!*

Think of the savings . . . both in operating costs and air consumption. With carbide bits the Thor Leg can replace drifters—and heavy mountings on scores of heavy duty operations . . . can drift in tunnels where drifters won't fit. Write today for catalog data.

FULLY AUTOMATIC—A quick, easy setup—just start the hole—set the leg at any angle between 30 and 45 degrees. . . the leg does all the lifting—all the constant pressure feeding . . . control the feed with a turn of the wrist!

INDEPENDENT PNEUMATIC TOOL COMPANY

AURORA, ILLINOIS

Export Division: 330 West 42nd Street, New York 18, N. Y.

Birmingham · Boston · Buffalo · Chicago · Cincinnati · Cleveland · Denver
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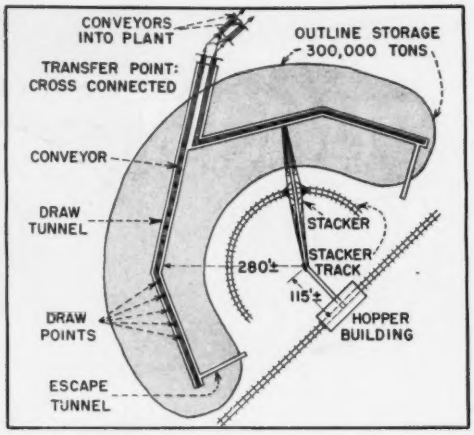
Thor

PORTABLE POWER

TOOLS

PNEUMATIC TOOLS • UNIVERSAL AND HIGH FREQUENCY ELECTRIC TOOLS • MINING AND CONTRACTORS TOOL

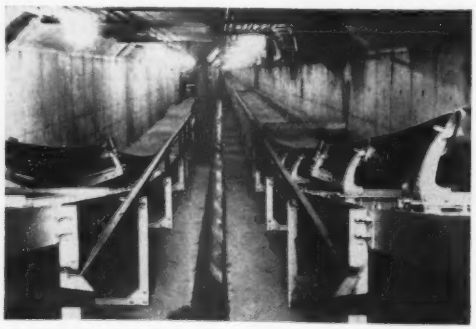
AERIAL VIEW OF STOCKPILE: Circular shape of pile allows for continuous change in grade of pile—from low-grade on one end to high-grade on other.



SKETCH OF DRAW SYSTEM: Four straight runs of tunnel under pile allow for draw from any point or points. System allows for precise blending of feed to plant.

Stockpile Allows for Close Blending

ROTARY STACKER is self-propelled. Operator in track-hopper building (left) positions discharge end over spot containing grade of phosphate being piled.



TWIN BELTS (traveling toward viewer) each carry rock from half of pile. Discharge of these belts, cross-connected at transfer, is final means of blending.

At Brewster, Fla., American Cyanamid Co. recently replaced a system of bins with a stockpiling plant.

Design of the new system places special emphasis on solution of many common stockpiling problems:

1. Material handling is entirely by power. Conveyor belts carry phosphate rock to the pile; draw is by gravity; and conveyor belts feed the plant.

2. Capacity is large. Outline storage is 300,000 tons, but the stockpile still works effectively with much smaller tonnages.

3. The pile is readily adapted to either sorted or graded storage or a combination of both. Though the 180-deg. pile at Brewster is segregated according to grade, it could just as easily be broken into three 60-deg. piles, each of a different size rock.

4. Blending control is easy to achieve. With a large number of draw points the operator has a wide choice in the points he can draw to achieve the desired blend. The transfer point is cross-connected to allow discharge from either or both stockpile belts to either or both plant-feed belts.

Flow. Rock from Cyanamid's two nearby phosphate mines arrives at the Brewster "dry" plant in hopper-bottom cars which empty directly into the track hopper. From the hopper, the rock is fed at 600 tons an hour (currently being stepped up to 800 tons an hour) onto a 36-in. belt running up the 80-ft.-high stacker. The draw points, evenly spaced in the reinforced concrete tunnel, are controlled by electrically operated gates through which rock flows to the reclaiming conveyors.

Results. The new system allows more efficient operation of the mines, prevents railroading delays, gives more storage capacity, more accurate blending, and permits better and quicker service to customers.

Credit. Engineering, specifications, and design were handled by Cyanamid's Central Engineering Division. The stacker was designed and supplied by Jeffrey Manufacturing Co.

OLD SHOVEL PARTS OUTLAST NEW ONES!

if you want more service from wearing shovel parts protect them with STOODY ALLOYS

ORIGINAL EQUIPMENT SIZE IS RETAINED. As most parts lose size, they also lose efficiency . . . worn teeth and worn bucket lips don't take a full bite. Worn idlers, pads and rollers cause trouble and delay. *Stoody Alloys give the protection where you need it, maintain all-important size!*

CONCENTRATED WEAR AREAS RECEIVE EXTRA PROTECTION. Bucket sides and bottoms develop distinct wear patterns. A few stringers of hard-metal in these areas slow down effects of wear, equalize overall bucket life.

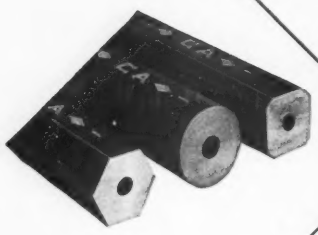
LESS DOWNTIME—FEWER REPLACEMENTS. Hard-facing usually doubles part life. On specific items, increases up to 3 or 4 times have been noted. *Keeping parts in operation means less downtime for repairs, fewer costly replacements!*

Why not get the most from your shovels by hard-facing now with STOODY ALLOYS?

Available for manual or automatic welding methods.

Consult your nearest Stoody Dealer listed in the Yellow Classified Telephone Directory under Welding Equipment & Supplies. He will recommend the BEST *Stoody Alloy for your job and provide a list of local job welders having Automatic Welding facilities—or write direct.*

STOODY COMPANY



NEW CRUCIBLE DOUBLE DIAMOND takes drill steel out of the "CROWBAR CLASS"

At last! A drill steel that's not in the "crowbar class" . . . because Crucible's new DOUBLE DIAMOND hollow drill steel is a *tool* steel . . . made by drill steel specialists to tool steel specifications. Its greater fatigue strength means lower cost per foot drilled . . . and saves those *valuable carbide bits.*

Find out first hand about this step forward in drill steel — find out how Crucible DOUBLE DIAMOND in your drilling operation does a better job . . . faster! Write for full details. Do it now!

this Alloy Hollow Drill Steel has greater fatigue strength . . . cuts bit losses . . . lasts longer

CRUCIBLE first name in special purpose steels

52 years of Fine steelmaking

HOLLOW DRILL STEEL

CRUCIBLE STEEL COMPANY OF AMERICA, GENERAL SALES OFFICES, OLIVER BUILDING. PITTSBURGH. PA.

REX HIGH SPEED • TOOL • REZISTAL STAINLESS • ALLOY • MACHINERY • SPECIAL PURPOSE STEELS

E & M J

NEW PRODUCTS DIGEST

For further information on these products, circle item numbers on card—insert and mail.

FEATURES

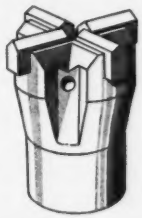
"Tailored" TC Bits

JUNCTION BIT & TOOL CO., Grand Junction, Colo., is now producing tungsten-carbide (Tungstone) insert bits which are "tailored" to meet specific requirements of mining projects. Ray Sullivan, well known for his pioneering work on tungsten carbide drilling in this country (see *E&MJ*, Mar. 1951, Pp. 57-60), is in charge of production of the bits. As a matter of policy, he says that his company requests prospective users of Tungstone bits to supply complete information about the size of rock drill to be used; type, texture, and hardness of rock to be drilled; type of water hole required, etc. A "tailored" bit to meet these requirements is then recommended.

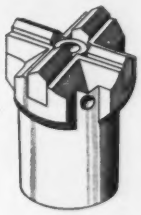
The bits are supplied with any type or size of thread desired. In certain experiments it has been found that some threads actually cause bit failure because the tightening action of the bit on the steel during drilling sets up excessive strains. Hence the right type of thread is important.

Three Types Available

Series A Tungstone. This series is designed with large gage and cutting edge clearances usually required for soft rock formations. Suitable for use with light drifters, jackhammers, wagon drills, and stopers. Sizes from 1½ to 3 in. Bit comes with one or two sideholes. Center hole is plugged, but may be left open if desired.



SERIES A TUNGSTONE BIT



SERIES B TUNGSTONE BIT

TUNGSTONE BIT CHISEL TYPE

Series B Tungstone. For use with heavy drifters, wagon drills, and in long-hole drilling. Contains standard side and center holes. Additional side holes may be ordered. Sizes range from 2 to 3 in.

Tungstone Chisel Type. Suitable for use where the four-point types will not work. This bit is faster in some types of rock.

Three Grades of Carbide

Tailoring of these bits is further refined by the selection of tungsten carbide inserts which will perform best for the rock to be drilled. Three grades are used: (1) Hard—for extremely abrasive rock, but for use with light machines. This type will outwear the tough type insert 1½ to 1. (2) Tough—a general purpose insert. Safest to use when in doubt, and suitable for large and small machines. (3) Soft—for limited use only.

The Junction company also makes integral-type insert bits. Tungstone bits are now being used in U.S.A., Canada, Africa and elsewhere.

For further information circle No. 1 on card opposite page 118. (1)

Goodman's New Diesel-Locomotive

THE MANCHA STORAGE BATTERY Locomotive Division of Goodman Manufacturing Co., Chicago, Ill., is now offering diesel powered locomotives for use in metal mines and tunnels.

The model shown at left is a 4-ton unit powered by a 45-hp. engine which drives through a torque-converter. Running speeds are from 3½ to 7½ mph, depending upon the drawbar pull demand. The locomotive shown here is operating in an eastern base metal mine on 24-in. gage track, and has an overall dimension of 42 in. in width, 55 in. in height, and 9 ft. 4 in. in length.

Exhaust gases are effectively conditioned by a water scrubber. (2)

RUGGED RELIABILITY
for continuous service

WEMCO Sand Pumps are designed for uninterrupted service — built to stand up under the toughest operating conditions. Careful engineering has eliminated parts subject to sudden failure. Abrasive action has been limited to four extremely hard, slow-wearing parts, and replacement is easy (at the operator's convenience) when pumping efficiency begins to drop.

5 DESIGN FEATURES THAT MEAN UNFAILING SERVICE

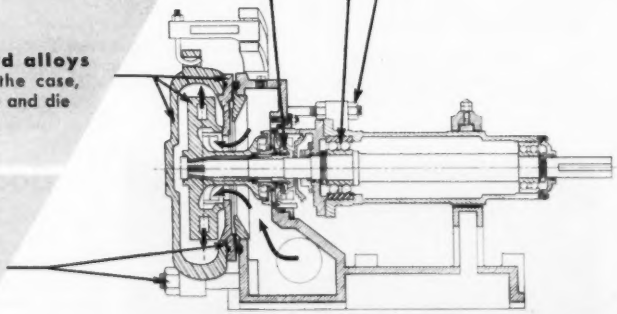
1 **External slippage adjustment** keeps correct runner clearance.

2 **Rigid shaft support** is provided by two double-row ball bearings, well lubricated and securely sealed from dirt and moisture.

3 **Centrifugal sealing** eliminates leakage, friction and sealing water dilution.

4 **Extremely hard alloys** minimize wear in the case, runner, follower plate and die ring.

5 **Quick disassembly features** cut time required for replacement of wearing parts to as little as 15 minutes.

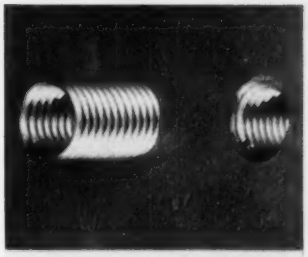


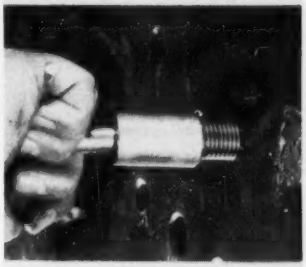
Available in sizes from 1¼" to 10". Write today for Bulletin No. P-15-1-1.

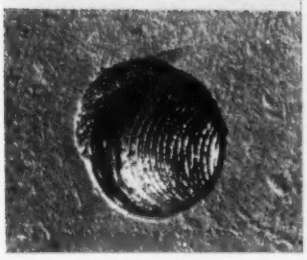
OTHER WEMCO PRODUCTS

Mobil-Mills • Coal Spirals • HMS Thickeners • HMS Pumps • Densifiers Cone Separators • Drum Separators • Fagergren & Steffensen Flotation Machines • Fagergren Laboratory Units • Hydroseparators • HMS Laboratory Units • Dewatering Spirals • Agitators • S-H Classifiers • Thickeners Sand Pumps • Conditioners

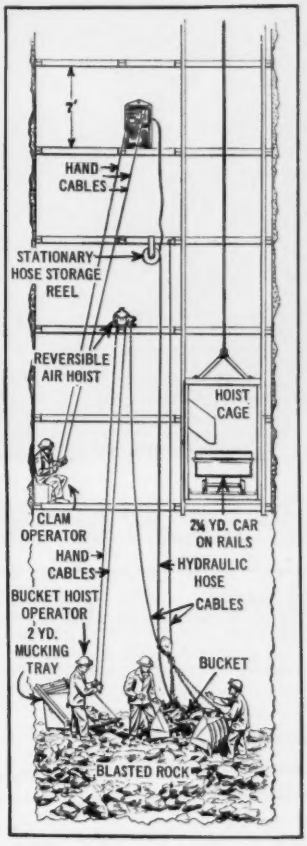
WEMCO
WESTERN MACHINERY COMPANY
760-766 FOLSOM STREET · SAN FRANCISCO 7, CALIFORNIA



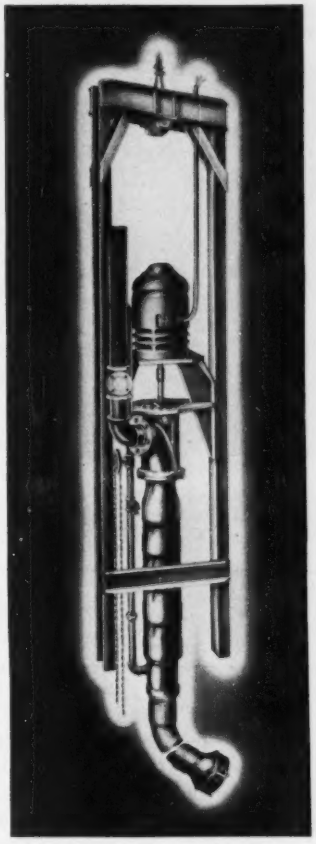




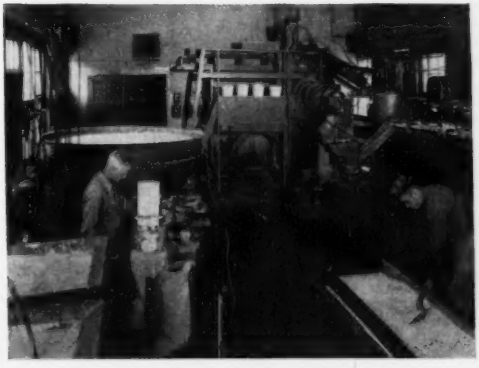
WIRE THREAD. This wire thread insert made by Heli-Coil Corp., Danbury, Conn., cuts down-time due to stripped or worn threaded holes. Insert threads are self-locking; will not yield to vibration. Should be ideal for vibratory screens, rock drills, jaw crushers, compressors, diesel engines, etc. (3)



HYDROMUCKER. Bucyrus Erie's new Hydromucker eliminates up to 99% of hand mucking in shaft sinking jobs. Hydraulically operated ¾-yd. clamshell is the most important feature. One man operates clam, another controls the bucket hoist as shown. A 15-hp. motor powers pump which operates hydraulic system. (4)

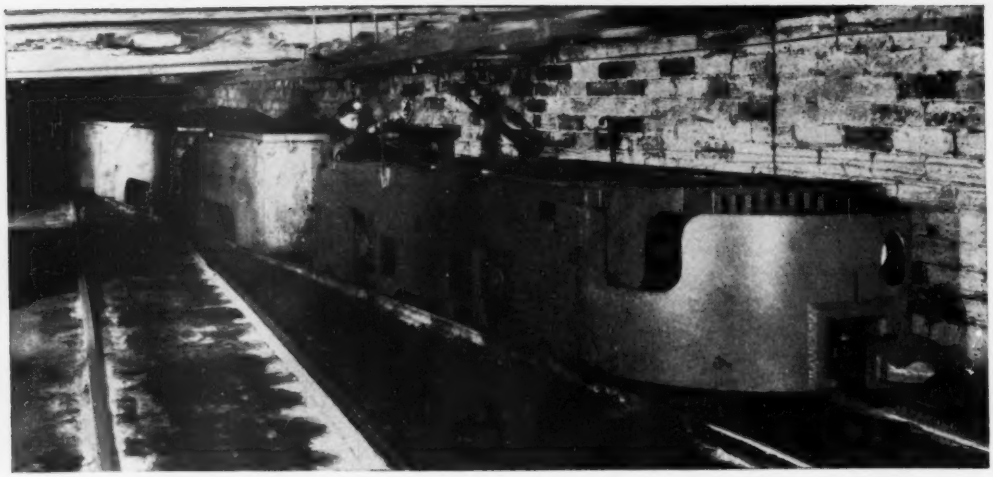


MINE PUMP. This close-coupled vertical turbine mine pump made by Fairbanks-Morse & Co., Chicago 5, Ill., is designed for service as a station booster, sump pump, and for shaft sinking. The motor is drip-proof, and contains moisture-resistant windings. Comes in a wide range of sizes, types, and capacities. (5)



ORE TESTING LABORATORY. Denver Equipment Co.'s modern continuous ore testing laboratory shown here is designed to "take the guesswork out of milling" and to develop flowsheets which will help the mine operator make a profit on his ore. The laboratory is set up to conduct tests involving crushing, grinding, classification, jigging, flotation and other processes. Over 150 different kinds of metal and nonmetallic minerals can be tested in DECO's laboratory.

During the past five years the DECO laboratory staff has completed successful tests on more than 1,000 ores covering 85 different minerals from 40 countries throughout the world. Charges for this test work are very nominal. —just sufficient to cover the actual operating costs including the analysis and assay (both fire and chemical) of the test products made. For complete information on DECO's ore testing service, circle No. 6 on the convenient reply card opposite page 118. (6)



O-B COUPLERS SUIT ALL MINE HAULAGE NEEDS!

The cars, locomotive, trolley system *and* the O-B Couplers used in this underground railroad are designed specifically for mine service. Curve radii, dips, speeds and dumping methods determine the coupler design that will best serve a busy haulage system, just as headroom and dumping methods influence car design. That's why O-B Automatic Mine Car Couplers, designed for heavy, high-speed mine car haulage are your best choice for safe, swift coal movement.

You'll do well to consider O-B Automatic Couplers when you remodel or replace your present cars. Ask your O-B representative for more information on these MINE couplers!

Ohio Brass

MANSFIELD OHIO, U. S. A.

CANADIAN OHIO BRASS CO., LTD., NIAGARA FALLS, ONT.

Because they are made especially for mine cars, O-B Couplers meet underground haulage requirements with these five features:

1. Extra-wide gathering range. Cars couple automatically on minimum-radius curves.
2. Positive interlock. Cars join securely on impact without attention.
3. Automatic self-centering. No need to align mating heads manually before coupling.
4. Tough, durable draft gear. Rubber-cushioned O-B Couplers absorb blows as high as 100,000 pounds.
5. Increased track stability. O-B Form-8 Couplers actually work against the cars' tendency to take a skewed position on the track.

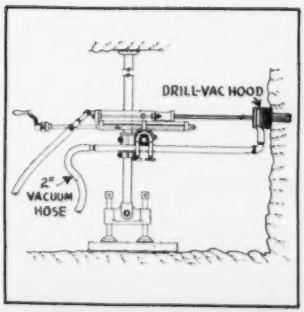
4292-M

ELECTRIC EXCAVATOR. Bucyrus-Erie Co.'s new 6-cu. yd. Ward-Leonard electric excavator (Model 150-B) features a lower boom section, tubular dipper handle, twin hoist ropes over an equalizing sheave, which accomplish both crowd and retract. The shovel is fully convertible to a dragline. (7)

TRUCK LUBRICATION. This 50-ton Euclid is powered with two 300-hp. Cummins diesel engines. Each engine powers a set of drive wheels through torque converters. Big job of lubricating this huge power plant is simplified by Graco Convoy Luber (right) fitted with pumps and lubricating lines designed especially for the truck. (8)

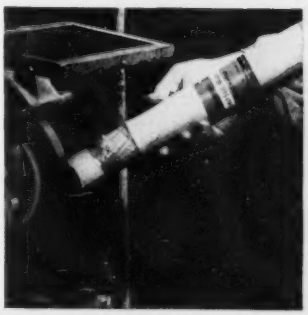
LOADER. The Frank G. Hough Co., Libertyville, Ill., introduces this 1-cu. yd. Payloader, tractor shovel with 60-hp. diesel or 54-hp. gasoline power. Rear-wheel steer makes it easy to operate. (9)

VARIABLE-SPEED MOTOR. Sterling Electric Motors, Inc., Los Angeles 22, Calif., offers Type KFEA motors with single reduction gears. Sizes, 20 to 25 hp. Speeds 728 rpm and lower. Infinite speed adjustments for ranges 2:1, 3:1, or 4:1. (10)



DRY DRILLING. Spencer Turbine Co., Hartford 6, Conn., makes a portable Drill-Vac unit which exhausts and collects dust from a Drill-Vac Hood mounted at collar of hole being drilled by stoper, drifter, jack hammer or wagon drill. (11)

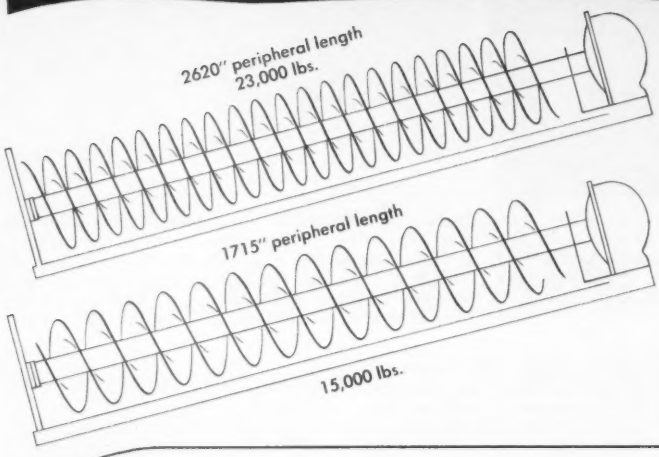
WAX LUBRICANT. S. C. Johnson & Sons, Inc., Racine, Wis. offers this No. 140 Stik-Wax to apply on grinding wheels. It lubricates, reduces heat, improves finish, cuts down clogging. Perhaps it will work on bit grinders. (12)



DIESEL SLIDE RULE. Cummins Engine Co., Columbus, Ind. offers this slide rule free which tells you at a glance how much you save with diesel engines as compared with gasoline power. (13)

JET PIERCING. Linde Air Products Co., New York 17, N. Y., now makes a FSJ-1 jet-piercing blowpipe for making secondary blastholes in mine pits. (14)

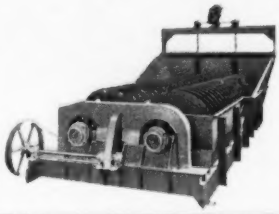
AKINS classifiers have 50% more capacity



MORE FLIGHTS

(Conveying Surface)

Per Foot in Akins Construction



The Akins Classifier uses the tightest (shortest pitch) spiral offered for mineral beneficiation. Careful comparative tests* prove that the standard Akins spiral pitch (one-half the diameter) is more efficient than spirals with longer pitches.

Because there is more steel in an Akins spiral, the initial cost is a little more, but this is quickly returned by the profits made possible by dependable steady operation at rated capacity PLUS, or 150% of the longer pitch machine. Write for details of mechanical and metallurgical advantages of Akins design and construction **

*A report of a technical investigation on the comparison of spiral capacities at different pitches is available. Ask for Technical Investigation No. 51.

**Ask for Bulletin No. 48 for closed circuit grinding, or No. 48-S for specialized applications that may solve your particular problem.

Licensed Manufacturing Representatives

Canadian Locomotive Co., Ltd.....Kingston, Ontario
Head, Wrightson & Co., Ltd.....Stockton on Tees, Eng.
John Carruthers & Co. (Pty.) Ltd.....Sydney, Australia
Head, Wrightson & Co., S.A., (Pty.) Ltd.....Johannesburg

Authorized Sales Agents

Edward J. Nell Co.....Manila, P.I.
Wright Bros., Credit Foncier Bldg.....Vancouver, B.C.

NO IMPORTANT AKINS INSTALLATION HAS EVER BEEN REPLACED BY ANY OTHER CLASSIFICATION EQUIPMENT

THE COLORADO IRON WORKS COMPANY

Colorado Iron Works Co.

1624 17TH STREET DENVER 2, COLO.

For Your Files

This informative manufacturers' literature is free unless otherwise specified. To obtain bulletins circle their numbers on card below and mail.

A NEW RUBBER LINER. "Linatex" is the name of a new highly resilient latex rubber product made by Linatex Corporation of America, Rockville, Conn. Linatex comes in 4x50-ft. sheets 1/32 to 1/2-in. thick. It has been used successfully to line pump impellers, pump casings, wood and metal tanks, pipe lines and valves, conveyor belts and pulleys, ore skips, chutes and launders, fans and ducts, and as an anti-shock and anti-vibration mounting for heavy equipment. It has also been used to handle acids, alkalies, and cyanide solutions in gold mills, paper mills, and acid plants. Special cements to bond the Linatex to various equipment surfaces are mentioned in a pamphlet released on this new product. (33)

CORROSION - RESISTANT FITTINGS. A whole line of corrosion-resistant pipe fittings is illustrated and described in a "Speedline" catalog released by Horace T. Potts Co., Philadelphia 34, Pa. With Speedline fittings you have a multiple choice of making butt-welded, expanded, and flanged or socket-type joints on virtually any installation. (34)

ALNICO PERMANENT MAGNETS. A complete list of stocked sizes and shapes of Carboloy Alnico permanent magnets is included in Bulletin PM-100 from the Carboloy Department of General Electric Co., Detroit 32, Mich. (35)

WIRE ROPE ATTACHMENTS. Macwhyte Co., Kenosha, Wis., has issued Catalog 5201 which describes and illustrates "Safe-Lock" wire rope assemblies including pin eyes, oval eyes, ring eyes, threaded studs, threaded sleeves, standard hooks, safety hooks, standard forks, and other terminal end attachments to wire ropes. (36)

HEATED VIBRATING SCREEN. It is no longer necessary to pound, brush, or flame-heat vibrating screens which have become blinded by fine moist particles—not if you use Allis-Chalmers' new "Thermo-Deck" heating unit for vibrating screens which eliminates blinding of medium or fine screen cloth. Heat is generated in the screen through electric current feeding from bus bars on either side of the vibrating screen deck. Operators report that screen cloth has been increased 300% through the use of this electrical heating device. To find out more about the product, circle No. 37, below which will bring you an illustrated bulletin on the subject. (37)

DIRECT-CONNECTED SYNCHRONOUS MOTORS. Electric Machinery Mfg. Co., Minneapolis 13, Minn., offers an excellent illustrated pamphlet covering the application of direct-connected synchronous motors to reciprocating compressors. (38)

HOW TO WELD IT BETTER. This is the title of a useful booklet issued by Eutectic Welding Alloys Corp., Flushing 58, New York, N. Y., which has been prepared for coal mine maintenance, but is equally useful for metal mining. (39)

SHUTTLE CARS. An extensive line of cable-reel shuttle cars and elevating conveyors is described and illustrated in a new bulletin by the Jeffrey Manufacturing Co., Columbus 16, Ohio. The dimensioned specification drawings showing plans and elevations of the various models are well done and should be valued by engineers who are planning operations using this type of equipment. (40)

FREE CONDUIT SELECTOR. Determine instantly what size conduit you need for various types and sizes of rubber, thermoplastic or lead-covered wires with the circular conduit selector offered by General Electric Construction Materials Division, Bridgeport 2, Conn. The reverse side of the dial-operated selector tells you what size of outlet, switch, or utility box to use for various conductors. (41)

REVERSIBLE IMPACT WRENCH. A new Thor 3/8-in. pneumatic reversible impact wrench for shop and industrial work is announced by Independent Pneumatic Tool Co., Aurora, Ill. in a leaflet just released. (42)

FOUR-CYCLE DIESELS. A complete line of one, two, and three-cylinder, four-cycle units for continuous or standby service is described and illustrated in a new bulletin by Nordberg Manufacturing Co., Milwaukee 1, Wis. The units range from 10 to 45 hp. with operating speed range of 1,200 to 1,800 rpm. (43)

FREE HARDFACING WALL CHART. American Manganese Steel Division of American Brake Shoe Co., Chicago Heights, Ill., offers a useful wall chart which lists equipment parts to be Amscoated together with the recommended rod, available sizes, and preferred method of application. (44)

AIR MOVER. Mines Safety Appliances Co., Pittsburgh 8, Pa., introduces a new air moving unit which operates on compressed air or steam. Pressure of compressed air or steam is used to induce a large flow of free air through a venturi-like horn-shaped tube with bell inlet. Ideal for blowing out gassy mine air from isolated sections, removing toxic fumes from metallurgical plants, removing dust-laden air from rooms, etc. (45)

50-MILLION HORSEPOWER. Detroit Diesel Engine Division, General Motors Corp., Detroit 28, Mich., has produced enough diesel engines since 1937 to total about 50-million rated

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to obtain further information on products and bulletins mentioned in the New Products Digest. Circle item numbers, tear out and mail.

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1	8	15	22	29	36	43	50	57	64
2	9	16	23	30	37	44	51	58	65
3	10	17	24	31	38	45	52	59	66
4	11	18	25	32	39	46	53	60	67
5	12	19	26	33	40	47	54	61	68
6	13	20	27	34	41	48	55	62	69
7	14	21	28	35	42	49	56	63	70

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norsepower. This is explained in a useful little pamphlet also showing applications of Detroit diesels in mines earth-moving operations, transportation units, oil well drilling, etc. (46)

NEW HEATER CUTS FUEL BILLS. A new heating device which burns liquid fuel in the form of gas and saves up to 20% on household fuel bills and as much as 50% in industrial uses is introduced by Robert Reichhelm Co., Stratford, Conn. Regenerated hot air is used to vaporize the liquid fuel to produce a clean hot flame. This unit generates gas from heavy liquid fuel such as kerosene, number 1, 2, and 3 fuel oil, and even diesel oil under some conditions. (47)

NEW FLOTATION FROTHER. Dow Chemical Co., Midland, Mich., announces a new synthetic flotation frother yielding better frothing characteristics and promising improved metallurgy for mining companies. It is called Dowfroth 250, a water-soluble material developed to meet growing needs for a powerful and non-collecting agent. (48)

RUST PREVENTIVE SURFACES. A new process of phosphatizing surfaces of iron and steel parts makes them rust-resisting and wear-resisting. Gears, pulleys, tappets, pistons, cylinder liners and other parts are now being processed in large numbers for the military by this new process described in a bulletin just released by Octagon Process, Inc., Staten Island 1, N. Y. (49)

PROPANE-BUTANE FUELED TRUCK. International Harvester Co. introduces for the first time in motor truck history a factory-built, liquefied petroleum gas-powered engine as Underwriters Laboratories listed equipment on trucks. These new LP-gas (propane-butane) engines are optional on all International truck models equipped with the company's Super Red Diamond engines. Large fuel tanks will permit trucks to run as much as 400 mi. between refuelings. (50)

CENTRALIZED LUBRICATION. The Farval Corp., Cleveland 4, Ohio, offers a copy of "Studies in Centralized Lubrication" which will show you how to save time, labor, power, bearings, lubricants, and increase production through the installation of centralized lubrication systems. Illustrations show successful applications on bowl classifiers in South Africa, and on a huge jaw crusher in Western Oregon. (51)

ELECTRONIC PILOT RELAY. An electronic pilot relay, capable of controlling large currents with a current flow of 2-millionths of an amp. through use of a cold cathode tube of unlimited life is announced by Haledy Electronics Co., New York, N. Y. It can be made to act responsively to slight currents passing through high resistances such as the human body to set off safety devices to protect workers. The relay will operate over any input resistance from a dead short to 10 megohms. (52)

LONG-WEARING MACHINE PARTS. Long-wearing machine parts made of Haynes alloys are described and illustrated in a new booklet by the Haynes Stellite Co., Division of Union Carbide and Carbon Corp., Kokomo, Ind. Parts included are bushings, lathe centers, rollers, wear strips, knives, valve parts, gages, guide rollers, rods, pistons, plungers. (53)

BIN-LEVEL INDICATOR. A new diaphragm-type bin-level indicator which can be installed anywhere within a free-flowing bin is announced by Bin-Dicator Co., Detroit 15, Mich. The units are mounted on pipes which serve as conduits for the electrical wiring system which actuates alarms or signals in response to varying positions of materials within the bin. (54)

GIANT FOG NOZZLE. A new giant fog nozzle capable of delivering a 500-gpm fog blanket with a large diameter and effective reach of about 80 ft. is announced by the Bete Fog Nozzle, Inc., Greenfield, Mass. Tremendous cooling effect of this large volume of fog will almost instantaneously put out large flammable liquid fires, and others. Small stones, bits of hose, etc., pass freely through the nozzle without clogging it. (55)

CONTINUOUS LOADER. Athey Products Corp., Chicago 38, Ill. introduces a new force-feed HiLoader for heavy earth, dirt, rock, etc. Capacity of the loader is up to 10 cu. yd. per min. An auger construction gathers up the material to be stockpiled or loaded and feeds it to a rotating chain-paddle mechanism which in turn moves the material onto an elevating belt containing flights on the surface. (56)

CLAMP-ON VIBRATOR. Viber Co., Burbank, Calif., makes a clamp-on air-operated vibrator which can be mounted on ore cars, trucks, and bins, etc., to aid in the unloading of gypsum, perlite, sand, coal and other bulk materials. The unit is equipped with clamps and jaws to aid in speedy mounting on steel frames or columns. (57)

CLAMP-ON VOLT-AMMETER. A volt-ammeter is as indispensable to a power-conscious operator as a stethoscope is to a doctor. For more information on a clamp-on unit, so small that it can be carried in a coat pocket, circle No. 58 on the reply card below. The unit is made by Pyramid Instruments Co., Lynbrook, N. Y. It will measure in the range of 0 to 1200 amp. and 0 to 600 v. (58)

MILLI-SECOND DELAYS. Atlas Powder Co., Wilmington, Del., releases a new 20-page manual describing and illustrating eight methods of blasting in quarries with milli-second delays. The manual contains new "machine-gun" photographs to illustrate progressive and alternate milli-second delay techniques. Sketches explain why the Rockmaster "16" blasting system gives better breakage, less vibration, reduced air blast, less back-break, and better toe action. This is a "must" for your blasting files. (59)

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New Products Digest

(*Continued from page 117*)

BACKSTOP FOR PUMPS. When electric current to a verticle turbine pump stops, the pumps may back-spin and damage bearings. To prevent this, U. S. Electric Motors, Inc., Los Angeles 54, Calif., has developed a Ballomatic Backstop which prevents reversal by means of ball bearings which slip into a ratchet locking mechanism when current is interrupted. (15)

BELT CONVEYOR CARRIERS. A new Belt Conveyor Carrier catalog has been released by Stephens-Adamson Mfg. Co., Aurora, Ill., which describes their line of carriers and includes engineering data and drawings to aid the designing engineer. (16)

EXCAVATOR. Koehring Co., Milwaukee 16, Wis., has released a catalog describing their new Model 304 excavator and its attachments. It is a ¾-yd. unit which combines a ¾-yd. dipper with a 25-ton lift crane on truck or cruising mounting, and 13.9-ton capacity on crawlers. (17)

AERIAL SURVEYS. A new booklet "Aerial Surveys and Maps from Photographs" in simple nontechnical language is published by Abrams Aerial Survey Corp., Lansing 1, Mich. (18)

AIR CLEANING. Westinghouse Electric Corp.'s Sturtevant Division, Boston 36, Mass. has issued a catalog covering air conditioning equipment, air handling equipment including ventilation units, and electronic air cleaning units including Precipitron. (19)

HYDRAULIC FILTERS. Over 200 hydraulic equipment manufacturers use sump-type liquid filters used to remove dirt and foreign matter from hydraulic systems on such equipment as conveyors, drills, hoisting machines, presses, punches, rail lifters, truck lifts etc. Marvel Engineering Co., Chicago 6, Ill. offers these units for installation in the mining industry. (20)

RAIL-JOINT LUBRICANT. The Texas Co., New York, N. Y., announces a new product—"Texaco Rail Joint Lubricant"—which is not only a lubricant but a rust preventative as well. It can be used as a spray regardless of moisture conditions, and should prevent the hazards of rail misalignment and frozen joints. (21)

SYNCHRONOUS MOTORS. Allis-Chalmers Mfg. Co., Milwaukee, Wis., announces a new bulletin describing a line of low-speed (450 rpm or less), coupled-type pedestal-bearing, synchronous motors approximately 100 hp. Power factor for motors is 1.0, or 0.8 or better leading. Units are suitable for grinding mills: tube mills; axial-flow and low-head centrifugal, and pumps. (22)

Safety Rules Save Employees' Lives

(*Continued from page 95*)

Workers have been crushed between trucks while coupling or uncoupling because the towed truck roiled forward or the driver backed without warning. Men unloading materials and supplies have sustained fractured skulls when they lost their balance and were thrown to the ground by a jolt from the wheels rolling into a hole or deep rut or from movement of the truck by the driver.

Similar accidents have happened in transporting men, when the driver started before all were on or off. The responsibility under such circumstances rests primarily with the driver, who should set his brakes and not move the truck until he gets the signal.

The truck must also be secured against accidental movement in stopping or backing. The safe procedure, especially on a slope, is to head the truck toward the bank, shut off the motor, and set the brakes.

When men are making repairs and adjustments, unexpected movement of the truck or of its parts may be very hazardous. Before attempting to work under a raised body, it must be in the upright position, securely blocked with a timber or some kind of block. Many repairmen have struck the controls while working under an unsupported raised body and have been crushed to death when it came down on them.

Serious injuries have also occurred when trucks supported only on jacks rolled or slid off them and fell on men working underneath. A jack is intended primarily for raising a vehicle to a suitable position, in which it is then supported by blocking or by one of the adjustable devices designed as a substitute.

The key man is the driver, although repairmen and other workers play an important part in safe truck operation. A new operator, whether experienced or not, should be given thorough instructions. His ability at the wheel should be constantly under the observation of a driver-instructor for at least three days. At the end of that period, he should be rated either as capable of taking over a truck, or as requiring additional training, or as lacking the qualifications essential for the work. This special training is a feature in the safety programs of many companies.

It is not necessary to change your present machine to accomodate our Vibrator Screens. The wedge shape of the screen wire with its non-clogging, non-blinding features permits perfect separation on wet or dry screening. The rigid construction adds considerably to the screens capability and efficiency. Proven in hundreds of installations.

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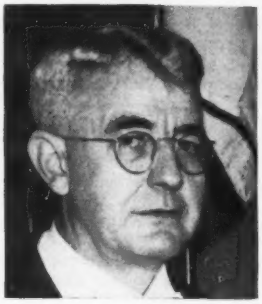
PERSONAL NEWS



MICHAEL L. HAIDER (left) vice president of Imperial Oil Ltd., Toronto, a Standard Oil of New Jersey Co. affiliate, formally took over duties as president of the American Institute of Mining and Metallurgical Engineers at their annual convention in New York, N. Y. WILLIS McGERALD PEIRCE (right), assistant to the general manager, Technical Department, N. J. Zinc Co., Palmerton, Pa., is the retiring president.

W. H. Goodrich, general manager, Chino Mines Division, Kennecott Copper Corp., Hurley, N. M., has been appointed state chairman of the mining division of the Rocky Mountain scrap mobilization campaign.

Thomas L. Carey, safety engineer at Potash Company of America, Carlsbad district, New Mexico, has been named assistant chief mine engineer. **Jack Hesler** will head the safety department. **Richard Nelson** will succeed Mr. Hesler as assistant safety engineer.

Fred H. Stewart, general superintendent in charge of Southwest Potash Co. operations, Carlsbad, N. M., has been named general manager. **W. Aubrey Smith** is assistant general manager.

John Martin, Jr., formerly assistant chief chemist in the Coleraine district, has been named assistant chief chemist of Oliver Mining Co.'s eastern district.

Howard F. Vultu, vice president, Marine Midland Trust Co., New York, N. Y., has been elected a director of Miami Copper Co. and its subsidiaries.

R. J. Hawkinson, has been appointed chief engineer of the Hibbing, Minn. district for Pickands, Mather & Co.

Walter Thomte, mining engineer with Pickands, Mather & Co., Bovey, Minn., has been promoted to assistant superintendent of the Danube mine.

J. F. Myers has retired as superintendent of concentration, Tennessee Copper Co., Copperhill, Tenn. **F. M. Lewis** will assume the position, and Mr. Myers will be retained in a consulting capacity.

G. A. Aspell, U. S. Bureau of Mines located on the Mesabi Range, is now at the Bureau's office, Mt. Weather, Bluemont, Va.

John Sheppard, Nashwauk, Cleveland Cliffs Iron Co., is now chief engineer with the Western-Knapp Engineering Co., Hibbing, Minn.

Thomas F. O'Neill has been named geologist in charge of the exploration office, Spokane, Wash., of Pacific Northwest Co., a New Jersey Zinc Co. subsidiary.

E. M. Stiles, superintendent of maintenance at Consolidated Mining & Smelting Company of Canada's Sullivan mine since 1949, has been appointed superintendent of the engineering department, Kimberley, B.C. operations.

Charles Segerstrom, head of Nevada-Massachusetts Co., Nevada, has been elected president of the American Tungsten Assn., succeeding **H. A. Savage**, Fresno, Calif. Other new officers are: **Roy Hardy**, Reno, Nev., director; **B. W. Voorhies**, Gabbs., Nev., director; **J. W. Hoefling**, Atola, Calif., vice president; and **M. D. Cromwell**, secretary-treasurer.

Otto Herres, vice president, Combined Metals Reduction Co., Salt Lake City, Utah, has been named chairman of the Program Committee for the 1952 Metal and Nonmetallic Mineral Mining Convention and Exposition of the American Mining Congress to be held in Denver, Colo., Sept. 22-25.

Robert D. Longyear, president of the E. J. Longyear Co., is leaving March 10 on a three-months' trip to Europe and Africa.

Frederick W. Denton, Jr., assistant superintendent, has been appointed superintendent of Oliver Iron Mining Division's Gogebic Range operations to succeed **Harry W. Byrne**, who has retired.

John Ohlson has joined the geological department of the Inland Steel Co. and will be stationed at Iron River on the Menominee Range properties.

Adolph Martz, of Jones & Laughlin Steel Corp.'s Minnesota Ore Division, has been made a pit foreman at the Columbia mine, Virginia.

Philip W. Chase, formerly manager of explorations for the Oliver Iron Mining Division, Duluth, Minn., has been transferred to the U. S. Steel Corp.'s raw materials department, Pittsburgh, Pa.

Robert P. Bell, assistant superintendent at Pickands, Mather & Co.'s Bennett mine, Keewatin, has been promoted to mine superintendent of the Cuyuna Range mines, Crosby, Minn. Mr. Bell succeeds **L. M. Becker**, superintendent of the new West Hill mine, western Mesabi. **Edward Tyler**, engineer at the Wade mine at Kinney, succeeds Mr. Bell at the Bennett mine.

Dr. LeRoy Scharon, associate professor of geology at Washington University, St. Louis, Mo., was elected chairman of the Mining, Geology, and Geophysics Division of the AIME and became a director ex officio.

Sherman R. Burdick is now consulting engineer for The Fresnillo Co., Mexico City, Mexico.

Robert C. Bacon has resigned from W. R. Grace & Co. to join Panaminas, Inc., New York, N. Y.

Kenneth Bickford, Crosby, Minn., has been appointed chief engineer for the Minnesota-Huron Iron Co., Ltd., W. S. Moore Co. subsidiary. Mr. Bickford will be in charge of the company's exploration work in Ontario, succeeding **C. H. Scheuer**, who has retired.

M. Y. Cameron, Kenor, Ont., has been elected president, Northwestern Ontario Prospectors and Developers Association.

S. J. McCarroll has been appointed general superintendent of Manganese, Inc., in charge of operations at Henderson, Nev.

A. J. Gould, general foreman at Inspiration Cons. Copper Co., Inspiration, Ariz., is now plant superintendent of the Yerington, Nev. leaching plant of Anaconda Copper Mining Co.

R. H. Nelson has resigned from the Mining Branch of RFC and will be available now for a limited amount

of geologic and mining consultation at 512 Clark St., Helena, Mont.

George C. Floyd, vice president of Vanadium Corporation of America, has been elected a director. **Patrick J. Gibbons** has retired as executive vice president and director of the company.

O. H. Gill, formerly maintenance engineer, has been appointed superintendent of maintenance for The Consolidated Mining and Smelting Co., Trail, B. C.

New officers of the Mexican National Iron and Steel Industry Chamber are **Enrique Ayala Medina,** president; **Antonio Castillo,** vice president; and **Horacio Paredes,** treasurer.

New York consultant, **Walter Rukeyser,** by United Nations appointment, has returned from Belgrade, Yugo., where he went in answer to a Yugoslav request for technical assistance in appraising the value and uses of the country's asbestos deposits.

GEORGE L. RATCLIFFE has been elected a vice president of National Lead Co., New York, N. Y. Mr. Ratcliffe has been general manager of the Baroid Sales Division since 1939 and a member of the board of directors since 1948.

H. Doyle, senior research engineer at The Consolidated Mining and Smelting Co., has been appointed supervisor of smoke treatment and ventilation, Trail, B. C.

Worth Hatch, formerly mill foreman at Balatoc mine in the Philippines, is mill superintendent at Minas San Andres, Honduras, C. A.

O. A. Power, formerly manager of J. R. Simplot Fertilizer Co., has been named manager of the newly formed Mineral Development Department of Westvaco Chemical Division, Food Machinery & Chemical Corp., Pocatello, Idaho. **H. B. Fowler, Ace Allen** and **W. C. Peters,** geologists; and **E. L. Spencer** and **W. A. Young,** engineers, will be associated with Mr. Power.

Eugene C. Anderson has been appointed to a six-year term as vice chairman of the State Economic

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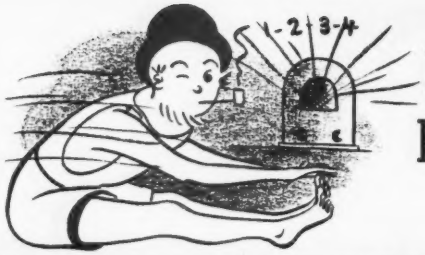

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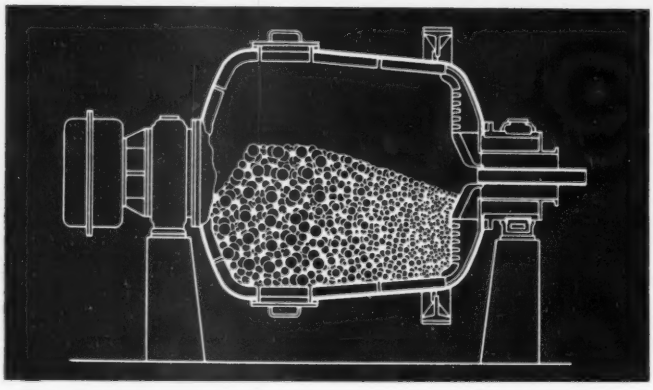

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HARDINGE TRICONE MILLS

Here are some of the reasons why the Hardinge Tricone Mill is more efficient than other mills:

1. The tapered barrel causes correct ball alignment. Grinding energy is conserved thereby. Ball consumption is reduced, the big fellows are kept away from the little ones.
2. The Tricone Mill occupies less floor space for a given grinding volume than any other type of mill ever built.
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5. Tapered ends reduce end friction, as is evidenced by lower liner consumption and power.
6. Ideal for large tonnages.

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See Branch Offices on Opposite Page

HARDINGE

Development Commission." Mr. Anderson also represents New Mexico on the Water and Minerals Resources Committee of the Arkansas-White-Red River Basin studies, being conducted by the InterAgency Committee of the Army Engineers and U. S. Bureau of Reclamation.

A. C. Hall has been transferred from Charcas Unit, Asarco, where he was superintendent to Lima, Peru, as managing director of the Northern Peru Mining and Smelting Co. **C. M. Syner**, former superintendent of the Santa Eulalia, succeeds Mr. Hall at Charcas. **M. C. Hirtzel** is now superintendent at Santa Eulalia.

L. J. Slessinger has been transferred from the San Carlos Unit, Asarco, to the Nuestra Senora Unit, Cosala, Sinaloa, as superintendent. **G. L. Fischer** succeeds him as superintendent at San Carlos.

E. H. Scheick has been appointed chief engineer, American Smelting and Refining Co., New York, N. Y.

Frank H. Eichler, formerly manager of Federated Metals Division, Asarco, Los Angeles, Calif., has been transferred to New York, N. Y. as director of purchases.

C. E. Nelson, formerly general manager of Neptune Gold Mining Co., Asarco subsidiary, has been transferred to the Buchans Mining Co., Ltd., Newfoundland, as general manager, succeeding **G. Thomas**, retired. Mr. Thomas has moved to St. Johns, where he has a consulting office for Buchans and private practice.

At Hollinger Consolidated Gold Mines, Ltd., Timmins, Ont., former shift boss **Len Spear** has been promoted to mine foreman. **Conrad Marson**, **A. C. Beaven**, **A. A. McDonald** and **William Neamtu** have become production shift bosses.

Dr. Richard M. Foose, head of the Department of Geology at Franklin and Marshall College, has been named the delegate of the AIME to the 19th International Geologic Congress in Algiers this coming summer.

Ellsworth Holman, Keewatin, and **Bromley Williams**, Nashwauk, Minn., have been appointed foremen at the Carlz iron mine, M. A. Hanna Co.

Luther Gribble, Ironwood, Mich., has been made assistant mining captain at the Geneva mine, Gogebic Range, of the Oliver Iron Mining Division, U. S. Steel Co.

Ben D. Roberts, former assistant manager at El Paso, Tex., has been promoted to manager of the southwestern department, American Smelting and Refining Co.

Leo Hennebach has retired as superintendent of the Arkansas Valley Plant, Asarco. **Thomas P. Fahey**, formerly assistant superintendent, will succeed him.

G. S. Hume, Ottawa, succeeded **Cy-**

ril W. Knight, president of the Geological Association of Canada. **Duncan R. Derry,** chief geologist for Ventures, Ltd. was elected vice president and **W. A. Roliff,** secretary-treasurer.

Harry V. Warren, geologist, was elected 1952 president of the British Columbia & Yukon Chamber of Mines.

Col. F. T. Matthais has been appointed assistant to P. E. Radley, project manager in British Columbia for Aluminum Company of Canada.

H. J. Sloman, mining engineer, has been appointed assistant to the director, U. S. Bureau of Mines, Washington, D. C.

Mousseau Tremblay has left the geological field staff of Labrador Mining and Exploration Co. to join the staff of Williamson Diamonds, Ltd., Nairobi, Kenya, British East Africa.

Dr. A. E. Moss has been appointed chief geologist for Iron Ore Company of Canada, replacing **Dr. J. A. Retty,** who will serve as consultant.

C. J. Smithells, director of research to the British Aluminum Co., Ltd., has been elected 1952 president of the Institute of Metals.

J. R. Beech has left England for Tanganyika to accept the position of chief assayer with Geita Gold Mining Co., Ltd.

A. D. M. Bell left England to join the Commonwealth Bureau of Mineral Resources as a resident geologist at Alice Springs, Australia.

H. F. Kelly has left England to become assistant chief mining engineer, Lota Mines, Chile.

R. W. Jigins has been promoted to concentrator superintendent of the Braden Copper Co., Chile.

OBITUARIES

Everett A. Calins, 73, died last month at Copper Cliff, Ont. Formerly assistant to the vice president of The International Nickel Company of Canada, Mr. Collins retired in 1946 after 26 years' service.

Arthur P. Earle, prominent in mining finance and management for many years, died in Montreal. He was president of Base Metals Mining Corp.; Consolidated Astoria Mines; Eldona Gold Mines; Donalda Mines; El Pen-Rey Mines & Oils; vice president of Athona Mines (1937) Ltd.; and director of several other companies.

For many years mine superintendent of McIntyre Porcupine Mines, and for the past five years consultant with that company, **Daniel E. Keeley** died last month at Schumacher, Ont.

David G. Lorsch, 80, died Feb. 14 at Toronto. A founder and charter member of the Standard Stock &

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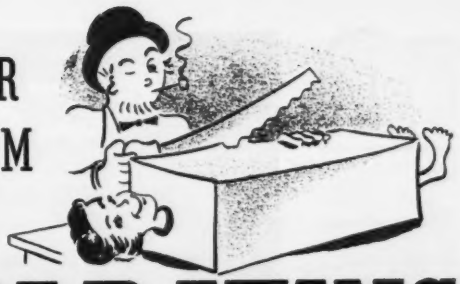

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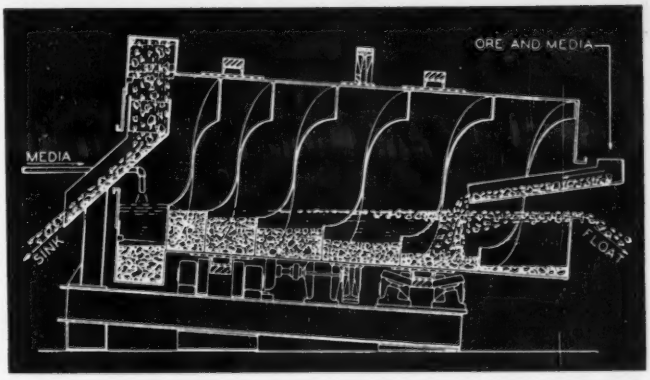

THEN INVESTIGATE HARDINGE HEAVY-MEDIA* SEPARATORS

The Hardinge Counter-Current Heavy-Media Separator is a slowly-revolving, inclined, cylindrical drum with spiral flights attached to the inner surface of the cylinder. As the drum rotates, the "sink" is carried by the spiral flights to the high end. The "float" overflows a circular weir at the lower end.

This simple but effective device has no internal moving parts to grind against each other. Thus, maintenance is extremely low. The quantity of media to fill this circuit is considerably less than with a cone of equal capacity. The separator will handle large pieces of ore—up to 6". It can act as a medium reservoir and will start up easily after several hours shut-down.

The equipment has been well received and thoroughly tested on field applications. Repeat orders are now coming in—the best endorsement of all!

** The Heavy-Media Separation Processes are licensed by the American Zinc, Lead and Smelting Company. American Cyanamid Company, 30 Rockefeller Plaza, New York 20, N. Y., are their sole technical and sales representatives for these processes.*

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A MORE EFFECTIVE WAY TO DEWATER ORE

No Other Machine Can Match The HEWITT-ROBINS ELIPTEX DEWATERIZER For Performance!

Results show that the Hewitt-Robins Eliptex® Dewaterizer, with its patented deck, effectively removes surface moisture from ore so that it can be handled on a belt conveyor without slipping . . . even though the ore is fed to the Dewaterizer in a continuous flow with 25% to 30% surface moisture.

Indications are that this compact, effective unit will provide a more efficient, lower cost answer to metal mining dewatering problems. Already, one ore processor is planning to move $-\frac{1}{8}$" ore directly from an Eliptex Dewaterizer to mill ore bins with only 12% to 15% surface moisture.

Additional savings are forecast for the *recovery* of these tailings. In all likelihood the Eliptex Dewaterizer will be able to save a high percentage of tailings now discarded due to present-day recovery difficulties.

Discover for yourself how the Hewitt-Robins Eliptex Dewaterizer can effect a saving in your processing plant . . . a space saving—a cost saving —an ore saving. Write for details.

HEWITT-ROBINS HR **INCORPORATED**

STAMFORD, CONNECTICUT

Mining Exchange, now merged with the Toronto Stock Exchange, he played a large part in the financing of many Canadian mines.

Henry Earl Giers, 77, Utah, died Feb. 14. Mr. Giers was secretary and treasurer of the Lenora Mining and Milling Co., the Hydro-Carbon Mining Co. and the East Antelope Mining Co. at the time of his death.

Horace Greeley Snyder, 78, an early developer of mines in the Tintic District, Utah, and Utah mine inspector, died Feb. 7 in Salt Lake City, Utah. Mr. Snyder participated in the early mining booms in Nevada, and in 1901 located initial claims on iron deposits in Iron County, Utah. He was associated with the late E. J. Raddatz in the R & S Mining Co. which led to development of the Tintic Standard Mine and North Lily and Eureka Lily.

Fred Flink, 61, Hibbing, Minn., passed away on Feb. 23. Mr. Flink was chief engineer for the Cleveland Cliffs Iron Co.

Sam S. Coldren, 52, died in Muscatine, Iowa, on Feb. 10. Graduated from Colorado School of Mines, Mr. Coldren worked in the Philippines and operated a mine in China. During World War II, he engaged in special work for the U. S. Government in Panama, Peru, and Bolivia, returning to the Philippines in 1945 to manage a manganese property in Mindanao for the Soriano interests.

Leon Starmont, 64, mining and travel editor of the *Spokesman Review* since 1940, passed away at his home in Spokane, Wash., on Feb. 14. Mr. Starmont had been part owner and editor of the *Spokane Press* and later published and edited the *Spokane Mining Truth*. He was a former secretary of the Northwest Mining Association.

M. D. Harbaugh, president of the Lake Superior Iron Ore Association, Cleveland, died at his home on March 19 of a heart attack. He was 59 years old.

Julian Lee Hayes, 60, died of a heart attack on Jan. 26. A long-time resident of Butte, Mont., Mr. Hayes held mining engineering positions in California, Arizona, North Carolina, and Colorado. He had been employed by International Smelting and Refining Co. at Utah properties since 1942.

W. J. Cook, 62, passed away in Temple City, Calif., Feb. 19. Educated in Portland (Ore.) and Notre Dame Universities, Mr. Cook joined Anaconda Copper Mining Co., leaving to join Arizona Brunswick Mining Co. A World War I coast guard veteran, he was with several oil companies and became special investigator for the State Board of Equalization, serving as political campaign manager for William J. Bonelli.

Arthur E. Bendelari, 72, former president and director emeritus of

Eagle-Picher Co., died of a heart attack at his Lexington, Ky., home. Mr. Bendelari, born in Toronto, began his career as manager of the Yellow Dog lead-zinc mine, leaving to join the Picher Lead Co., prior to its merger. He became president of Eagle-Picher in 1929, serving until 1937. He was Eagle-Picher representative to the American Mining Congress, American Zinc Institute and Lead Industries Association, and a member of the Masons and Union League Club.

LETTERS RECEIVED

Dear Sir:

In the February 1952 issue of Engineering & Mining Journal, on pages 154-5, is an article on germanium. In the article, your author states:

"Eagle-Picher Co. in the Tri-State district is the dominant producer; the company earned that position through the research efforts of Chief Physicist Dr. John Musgrave, who made germanium at a time when it was merely a curiosity."

This statement is incorrect and has caused me considerable embarrassment. I have been deeply interested in germanium and have been privileged in participating with others in this community effort. Many individuals from Eagle-Picher particularly from the Research and Production Departments have contributed to the program, among those prominent in the early development work being **F. G. McCutcheon, H. R. Harner** and the late **C. J. Sommerville.**

You can see therefore that the project was not a "one-man" affair as implied in your article and I hope that you can arrange to pay tribute to the other contributors whose efforts have been more important in this program.

J. R. MUSGRAVE
Chief Physicist

Eagle-Picher Co.
Joplin, Mo.

Dear Sir:

I take the pleasure of thanking you for the wonderful article that you have given to the placer mine owners that appeared in the January issue of the "Engineering and Mining Journal." May I state that it was a pleasure to read it; there are some very good ideas in it, and it will help me quite a lot.

WESLEY M. SHARPLES

Boise, Idaho

HUGH McKINSTRY
VANSERG LABORATORIES
CAMBRIDGE 38, MASSACHUSETTS

December 26, 1951

Editor
Engineering and Mining Journal
330 West 42nd Street
New York 18, New York

Sir:

Now that you have settled the spelling of phosphorus, please tell us whether it is "minable" or "mineable."

Fay (Glossary of the Mining and Mineral Industry) gives "minable" and does not even list "mineable."

Webster says in combining with -able, "a word ending in a final vowel generally drops the vowel," except where the preceding consonant is "c" or "g" (so that people won't pronounce peaceable "peakable").

But recently I have seen "mineable" in the E&MJ and also in some USGS publications. Students always insist on spelling it that way until corrected. Shall we hold out for "minable," or let nature take its course?

The profession, I am sure, will bow to the dictum of the editor of E&MJ.

Very truly yours,

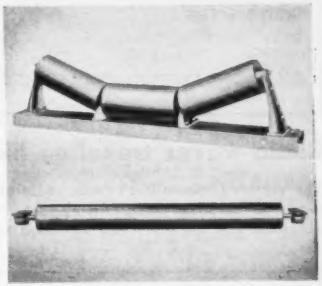
Hugh McKinstry

HUGH McKINSTRY

Now that we find ourselves resting in the uneasy seat of authority, we are forced to put forth our views for the profession—and posterity.

Fay got his spelling from the Standard Dictionary; we have been accustomed to following Webster, who prefers "mineable." Our editors agree with him 100%.

HEWITT



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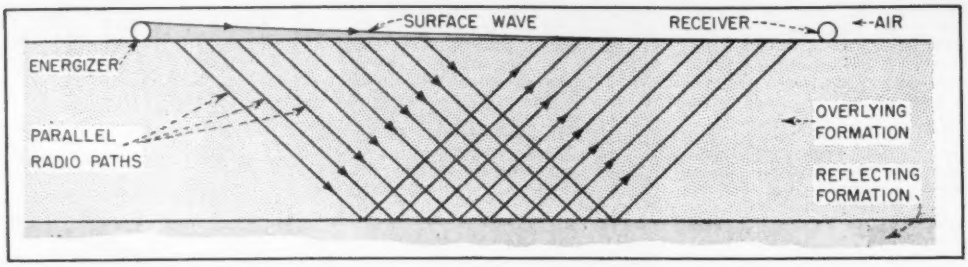
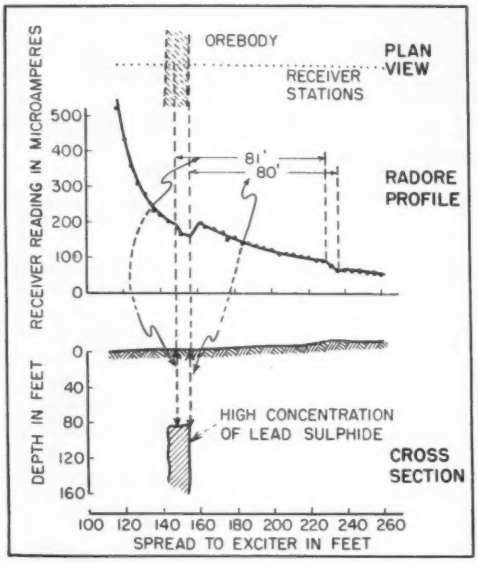


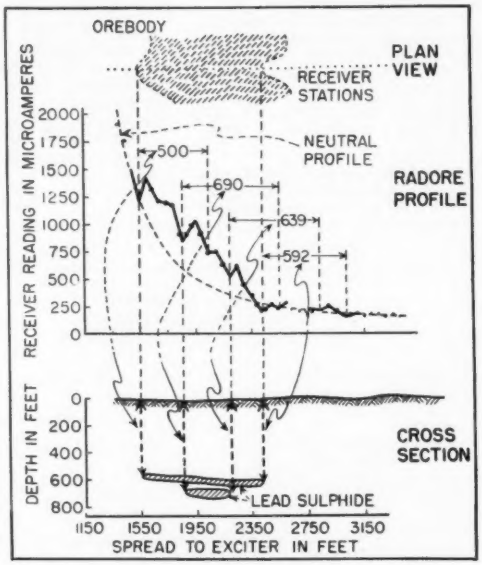
Radio waves traveling like this . . .

The exciter (transmitter) feeds radio energy to the energizer (a resonant transmitting antenna with one end grounded and the other end stretched along the ground). Waves refract downward in parallel paths and are turned upward by reflecting formation. Loop antenna of receiver picks them up at air-ground interface. Field technique is to take several receiver readings in a line outward from one energizer setup.



picked up this known orebody . . .

Radore unit was tested on known orebody in vertical crevice of Galena limestone in Illinois. Orebody was 12-ft. wide with crest 86-ft. deep. Radore profile gives good indication of width and shows depth as about 80 ft. Data from Eagle-Picher Mining & Smelting Co. Mr. Barret also described successful tests on sphalerite, marcasite, iron-rich sulphide complexes, and other minerals.



and discovered this one.

This and like profiles led to discovery of a new branch of Indian Creek orebody in southeastern Missouri. Readings compared to neutral profile indicated wide, gently dipping top orebody and gave close estimate of depth. Drills then proved presence of top orebody, found lower one, and gave thickness of both. Restudy of Radore profile then showed limits of lower one. Data, St. Joseph Lead Co.

Radore: A New Exploration Tool

"RADORE" is a new geophysical method which uses radio waves to detect subsurface mineral deposits. Developed during the last 15 years, it has been used commercially for the last two. "Radore" profiles, properly interpreted, give indications of not only the presence but also the outline and approximate depth of mineral deposits. The system is also being used for detection of petroleum deposits under the trade name "Radoil."

Early work was started more than 15 years ago by William M. Barret, Inc., and its research and manufacturing affiliate Engineering Research Corp. Most of it was aimed at detection of petroleum deposits, but in 1937, a field crew experimentally mapped lode-gold deposits in California and Nevada. Encouraged by the results, Barret continued its research and development.

In 1949 "Radoil" was made avail-

THIS MONTH IN MINING

able on a limited scale to a cross section of the petroleum industry. During the past year, six crews have been operating commercially for oil-company clients and licensees.

In 1949 "Radore" was tested in the Fredericktown and Doe Run Junction districts of southeastern Missouri. As a result of successful test location of known lead deposits, a large mining company obtained license to use the system and has operated one or two "Radore" crews continuously for the past two years.

Equipment	Size	Lb.
Exciter	11 x 9 x 6¾"	25
Energizer		
Receiver	9 x 11 x 5"	12
Loop	18 x 18 x 2"	4½
Tripod	47"	8¼

The equipment is portable, self-contained, battery-operated and made for rugged use. It can be used at any of the five geophysical frequencies between 1,614 and 1,700 kilocycles.

Principle. A unique antenna called the energizer sends radio energy in a surface wave along the ground. Part of the surface wave refracts downward and is in turn reflected upward from mineral variations (fault planes, orebodies, changes of strata) below. The receiver gets significant signals from 1) the surface wave and 2) subsurface reflections. The two add vectorially; the subsurface wave either adds to or subtracts from the surface wave depending on time and space relationships. Subsurface mineral anomalies show up as anomalies on the "Radore" profile; these "Radore" anomalies are in turn compared with a neutral profile—one taken at a nearby place where no anomalies exist. Sulphide ore deposits generally send up strong reflections which evidence themselves as strong "Radore" anomalies.

Field Application. Crews generally consist of four men: party chief, exciter operator, receiver operator and assistant receiver operator. Best readings are obtained when the exciter is placed to one side of the orebody at a distance equal to twice the depth of the ore deposit; however, good readings can be made at a distance of from one to five times the depth. Successive receiver readings are taken at intervals of 4 to 50 ft. extending in a straight line from the exciter.

Interpretation. A "Radore" profile shows a "break" over each boundary of an ore deposit. Further along, at a distance nearly equal to the depth of that boundary, it shows a "delayed break." Depth of the particular boundary is calculated by the distance between the "break" and the corresponding "delayed break." Width of the deposit is indicated by the width between boundary breaks of the over-the-orebody anomaly.

Application. The method has been used successfully in mapping vein deposits of gold; sulphides of lead, zinc, iron and iron-copper where sulphide concentrations were upward of 2%. Field studies are being made on certain nonmetallic minerals. Field results indicate that the method can be used successfully on deposits up to 900 ft. deep; research may well extend that working depth.

SUMMARY OF FEATURES.

1. Use of fairly short-wave radio enables much more sensitive delineation of subsurface features than can be done with longer-wave methods.

2. The equipment sends radio energy underground and receives it from underground at a much higher efficiency than conventional radio apparatus. The result is high sensitivity.

3. Fairly low cost, easy portability, avoidance of elaborate preparation, and the results that have been attained indicate a rather wide range of possibilities for "Radore" as a new pre-drilling exploration tool.

This information was abstracted from a talk given by William M. Barret at the 1952 Annual Meeting of AIME. Mr. Barret is president of William M. Barret, Inc., Consulting Geophysicists, Giddens-Lane Bldg., Shreveport, La.

Taconite: Erie Announces Plans for Commercial Production

MOST AMBITIOUS TACONITE PLANS revealed to date are those of Erie Mining Co. Elton Hoyt II, president of Erie, announced that his company plans to spend $300 million on a taconite program that will stretch out over the next several years. Initial output capacity, to be reached by 1956 or 1957, would be at least 5 million tons of pellets annually; later, it would be expanded to 10.5 million. Erie has applied to DPA for a certificate of necessity covering the entire $300-million project, and is now awaiting action by DPA and resolution of certain tax problems before it turns on the green light.

Erie is owned jointly by four companies: Bethlehem Steel Corp. and Youngstown Sheet and Tube Co. hold major interests; Interlake Iron Corp. and Pickands, Mather & Co. hold the balance. Erie has been studying the problems of taconite mining and beneficiation for several years. In June 1948, the company commissioned a large pilot plant near Aurora, Minn., and since then has been the largest (but still experimental) producer of taconite concentrates. In 1951, Aurora rolled out 70,000 tons of pellets.

Center of activity will be the beneficiating plant. It will go up about 3 mi. north of Partridge lakes, which are east of Aurora and about 75 mi. north of Duluth. Water will come from the lakes. Power facilities will also be constructed as part of the program. About 4 mi. east of Aurora (west of the lakes), a new town will spring up to house some 1,500 employees and their families; that will probably mean a town of about 6,000 people by the time the first phase of production gets under way.

Harbor facilities will be constructed near Two Islands, on the Lake Superior shore about 85 mi. northeast of Duluth. And a 65-mile railroad will be constructed between the beneficiating plant and port.

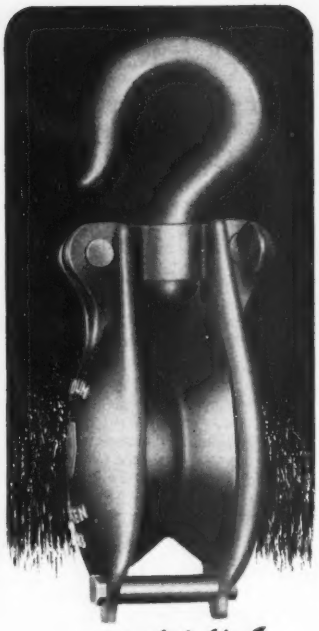
Yolo Plans Steel Plant Near Sacramento, Calif.

YOLO STEEL & METAL CORP. has received a DPA certificate of necessity for a plant rated to produce 1,000 tons of pig iron per day. The certificate permits five-year write-off of 85% of the $44 million the company plans to spend.

An initial blast furnace would be built on one of four sites which Yolo is currently negotiating for and which are in Yolo County, across the river from Sacramento. A steel mill rated at 660,000 tons per year would be built at a later date.

Finances, according to company president G. I. Dumond, will be arranged for privately from firm commitments now in hand. There'll be no stock promotion or Government loan.

About its source of iron ore, Mr. Dumond states that the company has drilled up 8 million tons of ore near the lake backed up by Shasta dam, about 150 mi. to the north of Sacramento; that there may be enough ore there to last for 40 years; and that



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SLUSHER BLOCK

The Skookum 708S block *(pictured above)* has been in production for six months. Yet, this is the first announcement.

WHY? Because an enthusiastic salesman told several customers about this block while it was in design. Those customers took everything we could produce.

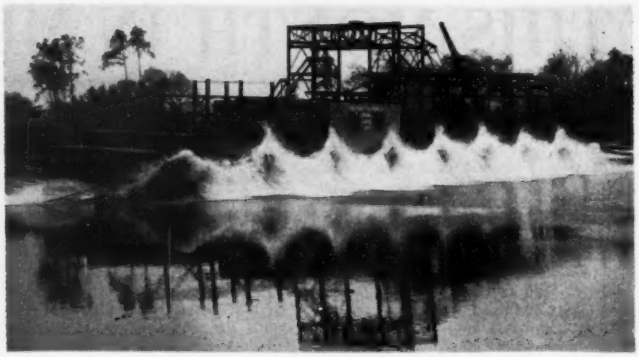
The exceptional broad throat of this block passes knotted lines. Equipped with special alloy sheave and sides, the 708S can be picked up by magnets should it ever find its way into a load of ore.

Holds 4½ times more grease than comparable blocks. Patented Skookum grease seal guards roller bearings from moisture and dust. Accommodates ⅜ and ½ inch lines. Maximum weight 36 pounds.

Built specifically for slusher mining.

SKOOKUM CO. INC.

8504 N. Crawford, Portland 3, Ore.



SULPHUR-MINING BARGE, shown here at launching, is a portable unit for mining sulphur by Frasch process. This summer, the completed barge will be towed 65 mi. from Grand Ecaille, La., to Bay Ste. Elaine, sunk on a prepared bottom, and put into production.

Amphibious Sulphur Mining

A NEW KIND OF SULPHUR MINING will begin late in 1952 when Freeport Sulphur Co. starts to operate its new plant at Bay Ste. Elaine, La. Instead of being in a land-based plant, the Frasch injection plant will be mounted on a barge. Boats will be used instead of trucks or tractors. Canals will replace roads. And all pipe lines will be supported on piling bents.

Here's why Freeport chose to build a portable "amphibious" plant at Bay Ste. Elaine:

The orebody was relatively small and would not support a large capital investment.

Supporting a permanent structure on the soft salt marshes in the area would be a tough and costly job. On similar marshland, the permanent plant at Grand Ecaille required 5,000 piles, 75-ft. long, driven on 2'-8" centers.

If the venture proves unprofitable or short-lived (and sulphur mines are hard to predict), Freeport can move the plant to a new site.

The system at Bay Ste. Elaine has another new feature—the use of brackish marsh water. Fresh water is not available there. Salty water has never before been used because the salt corrodes equipment excessively and it deposits as scale in boilers and lines. Freeport will use a new system which includes de-aeration and heating in such a way as to minimize these troubles.

The mining barge is designed to furnish 1,750,000 gallons of superheated water at 375 deg. F. Injected into the well, this water transmits enough heat to melt sulphur from the formation. Molten sulphur (of plus-99.5% purity) settles to the bottom of the well (it has a gravity of about 1.8) and is pumped to the surface. The mining barge also will supply 400 cfm of air at 500 psig, 600 kw of power, and other auxiliary services.

Hot liquid sulphur will be loaded into transport barges (two at Bay Ste. Elaine) which will carry 1,000 long tons to Port Sulphur, 75 mi. to the east. There the sulphur will be piped into freezing tanks and prepared for shipment and sale.

Data from a talk by Z. W. Bartlett, C. O. Lee and R. H. Feierabend, Freeport Sulphur Co., delivered at 1952 Annual Meeting of AIME.

---

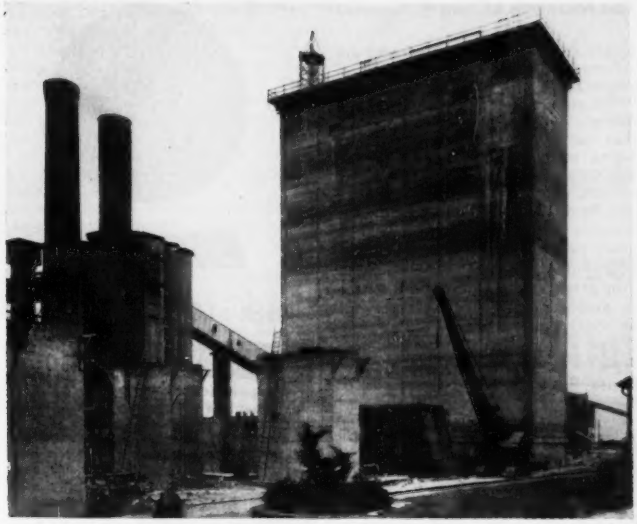
the company has 200 million tons of ore in five California counties.

Coal, he says, will come from deposits near Kemmerer, Wyo. that Yolo has leased from the Government.

Kaiser Plans Fluorspar Mill for Baxter Mine

NEAR GABBS, NEV., about 70 mi. southeast of Fallon, Kaiser Aluminum & Chemical Corp. plans to complete a new fluorspar flotation mill late in 1952. As yet, site and size of the mill have not been selected, but the company has announced that the mill will have sufficient capacity to handle ore purchased from other Nevada deposits. The product will be acid-grade fluorspar which Kaiser needs for its expanding production of aluminum. Operating at capacity, the company will need about 31,000 annual tons of acid-grade concentrate for its Mead, Tacoma, and Chalmette plants.

Baxter mine, 10 claims newly acquired from H. W. Gould & Co., will



SILO FOR STORAGE OF SIZED DOLOMITE is 122-ft. high and has 12 bins. Concrete contained Basic's own minus-0.075-in. stone as sand, and was poured by slip-form technique. Concrete piers are for rotary kilns.

Biggest Silo Will Feed Biggest Kilns

AT MAPLE GROVE, OHIO, this silo-type stone bin was recently completed by McDonald Engineering Co. for Basic Refractories, Inc. Of its 12 bins, eight will be used for raw ⅝-in. dolomite, and will hold 10,250 tons. From the bins, raw dolomite will go to two 390-ft. rotary kilns that will be the longest in the refractories industry.

This equipment is part of a $3.5-million expansion program which Basic expects to complete about mid-1952, and which will up Maple Grove's production of dead-burned dolomite from 600,000 to about 900,000 tons per year. Big market for the product is the expanding steel industry; making one ton of steel requires up to 70 lb. of these refractories.

be developed further by deepening existing shafts which now bottom at about 400 ft.

Foreign State Rejects $10-Billion U.S. Loan

DEBIT, RURITANIA, APRIL 10—Prime Minister Umgluck Fastaris today told newsmen that this nation felt obliged to refuse a $10-billion loan being offered by the United States. Sources close to official leaks had buzzed with the news for weeks, but today's pronouncement was the first official mention of the unheard-of step, which is expected to bring severe reverberations in Washington.

No official explanation accompanied the statement, but Debit's cafes are seething with rumored reasons for rejection of the loan. Garnered from many top-secret sources, the story amounts to this: Ruritanian engineers, working in the remote vastnesses of the Plural Mountains, have discovered deep deposits of pure shmirrium, an element so new and rare that no uses for it have yet been found. The shmirrium occurs in elemental form as crystals of the mineral shmirringerite (named after the scientist who discovered it and not to be confused with schroeckingerite). Astute Ruritanian propagandists have spread the report that it might become dangerous for any one nation to have too great an amount of an element potentially so valuable. Consequently, the nations of the world have vied with one another in stockpiling shmirrium, and have come to ignore Ruritania's other great exports, copper and uranium. The shmirrium trade has brought the nation great prosperity and an industrial boom. The latter, however, has emphasized only two activities until now—building shovels to dig the stuff with, and erecting laboratories to find out what to do with it. Food, Ruritania ignores. Demand for labor in the shmirrium mines has eliminated all unemployment.

The shmirrium boom is probably responsible for the peaceful state of world affairs, since nations anxious to

A WELL-KNOWN Idaho mine is emptying the ore cars shown herewith in 10 seconds flat. It is doing so with the help of a CLEVELAND Type LSRR air vibrator. With this vibrator the ore is emptied without any bumping with a lomocotive. Dumping time is reduced to one-third to one-tenth of that required before the vibrator was installed.

One man handles the complete operation.

It's a simple operation: The vibrator is permanently installed on an air line along side the track over the ore pocket. Each car on the level has a female bracket welded on the sloping side of the car. As a car is pulled over the pocket, the dump is tripped and the vibrator slipped into the bracket. Air is turned on with a hand valve, the car is emptied, and the vibrator is lifted from the bracket.

The CLEVELAND Type LSRR is being widely used on other materials handling equipment, such as bins, hoppers, chutes and flasks. Its intensity of vibration can be varied at will, to either gently persuade the material or deliver heavy, hammer-like blows.

What's Your Problem?

We have a complete line of air vibration equipment.

THE CLEVELAND VIBRATOR COMPANY

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Flexible ALL METAL COUPLINGS
FOR POWER TRANSMISSION
REQUIRE NO MAINTENANCE

Patented Flexible Disc Rings of special steel transmit the power and provide for misalignment and end float.

Thomas Couplings have a wide range of speeds, horsepower and shaft sizes:
½ to 40,000 HP
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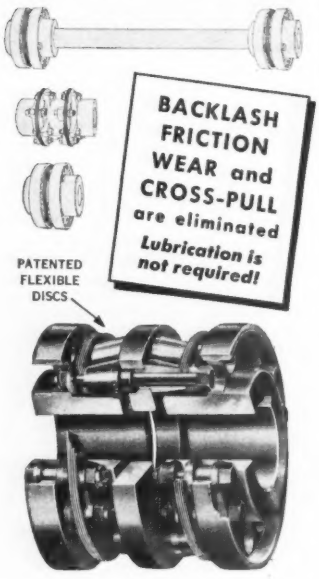
Specialists on Couplings for more than 30 years



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secure stocks of the vital mineral are reluctant to cause any international disturbance.

One rumor this correspondent found difficult to prove or disprove. It holds that prosperous Ruritania contemplates offering the United States a loan of fifty-trillion cordilleras (the national currency) and that America will have to accept for two reasons: America needs the money to lend to other nations to finance their shmirrium purchases; and no nation, however great, is going to offend Ruritania, producer of so valuable a mineral as shmirrium!!

This report came by overseas cable from a completely unreliable source named William Sparks, University of Chicago.

Kaiser Is Boosting Pig Capacity by 50%

WITH $65 MILLION in private financing assured, Kaiser Steel Corp. is expanding by 50% the pig-iron capacity of its plant at Fontana, Calif., and is also boosting coal, iron-ore, coking, and steelmaking facilities.

The expansion centers around a third blast furnace which, rated to produce 438,000 annual tons of pig (same as the first two), is scheduled to go into operation in the spring of 1953; at that time Fontana's total pig capacity will be 1,314,000 annual tons. Also included in the Fontana program are a ninth open-hearth furnace, 90 new coke ovens which are to be ready by December, 1952, and two additional rolling stands in the hot-strip mill.

At its iron-ore and coal mines, the program will mean roughly a 50% increase in equipment (mining, haulage, crushing, and transport) and housing facilities.

Exploration Sets Stage for New Tri-State Pit

EXPLORATION, INC., a geologic-geophysical company under the direction of R. Maurice Tripp, president, is developing a new zinc-lead pit in the Tri-State. Its mine to be is the Kelnor, about 4.5 mi. northwest of Joplin, Mo. Supervising the operation from Joplin is Dr. Richard Gaines, resident manager of Exploration, and Brown Badgett of Badgett Mine Stripping Corp.

Discovery. The company became interested in the Tri-State district when it sent a crew there to test some geochemical prospecting ideas. Under test, the ideas looked promising, so the company optioned and later purchased 80 acres on which to try them out commercially. On one 40-acre holding (the Kelnor), geologic and geochemical work proved a mineable orebody.

RUBBER CONVEYOR BELTING

TOUGH COVERS Heavy duty, specially compounded abrasive resistant rubber covers having high tensile strength (2500-3000 lbs.). Thoroughly capable of withstanding the abrasive action of bulk materials.

STRONG CARCASS Constructed of finest quality 28 and 32 ounce tough cotton duck, properly treated and impregnated to avoid mildew from moisture and atmospheric conditions. Each ply has a 16-19 lb. average friction pull.

FLEXIBILITY Careful attention has been given in the construction of all belts to have the proper flexibility assuring the following features: troughs easily, runs true on idlers, gouge resistant.

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WE HAVE 8" TO 48"

IMMEDIATE SHIPMENT FROM STOCK

Width	Ply	Thickness Top Cover	Thickness Bottom Cover	Type of Duck Carcass
8"	4	1/16"	1/32"	28 Oz.
10"	4	1/16"	1/32"	28 Oz.
12"	4	1/16"	1/32"	28 Oz.
14"	4	1/16"	1/32"	28 Oz.
16"	4	1/8"	1/32"	28 Oz.
18"	4	1/8"	1/32"	28 Oz.
20"	4	1/8"	1/32"	28 Oz.
20"	5	1/8"	1/32"	28 Oz.
24"	4	1/8"	1/32"	28 Oz.
24"	5	1/8"	1/32"	28 Oz.
26"	5	1/8"	1/32"	28 Oz.
30"	4	1/8"	1/16"	32 Oz.
30"	5	1/8"	1/16"	32 Oz.
30"	6	1/8"	1/16"	32 Oz.
36"	6	1/8"	1/16"	32 Oz.
42"	5	1/8"	1/16"	32 Oz.
48"	5	1/8"	1/16"	32 Oz.
48"	8	1/8"	1/16"	32 Oz.

SEND US YOUR INQUIRIES FOR OTHER INDUSTRIAL RUBBER PRODUCTS.

INQUIRE FOR SIZES NOT LISTED ELEVATOR TRANSMISSION & V-BELTING ALSO IN STOCK.

Write for Free Booklet on Installation, Care & Maintenance of Conveyor Belting.

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Phone: Digby 9-3810

Geology and reserves. The Kelnor is known locally as a soft-ground orebody which is characterized by a slumping or mineralized Pennsylvanian shale into a sink hole in the Missippian lime. Drilling so far has proved 300,000 tons averaging about 4% combined lead and zinc sulphides. Overburden averages 30 to 40 ft.

Mining. Kelnor is being operated as an open pit with scrapers and dragline under a joint arrangement between Exploration and Badgett Mine Stripping Corp. Flowage of slumped shale and low-grade ore prevents shaft mining.

Milling presents a problem because the ore is partly siliceous and partly shaley—most mills in the district are not set up to handle shaley ore. A washing plant on the property may solve this problem.

Mostest Crusher Ever Will Go to Reserve

ALLIS-CHALMERS Manufacturing Co. will build the biggest, heaviest crusher in the world for Reserve Mining Co. It will go into the taconite plant Reserve is putting up at Babbitt, Minn. It's going to be so big, according to A-C's G. V. Woody, that it will take more than two years to build the patterns, make the castings and do the necessary machine work on the unit.

Here's a brief idea of the size:

Capacity. Taconite (plenty tough) at the rate of 3,500 tons per hour. That's equivalent to more than 5 million tons of 65% concentrate per year.

Power. Two 500-hp motors.

Weight. More than 1,250,000 lb. (The heaviest crusher to date weighed about 1,000,000 lb.)

Height. About four stories.

Shaft. A steel forging about 27-ft. long with a maximum diameter of about 4.5 ft.

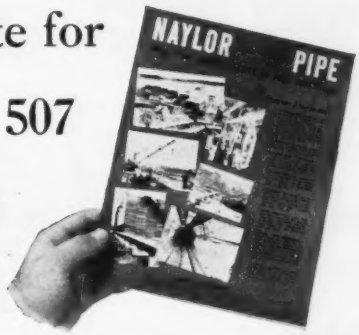
Guatemalan Mine Aims for Production in 1954

COMPAÑIA MINERA de HUEHUETENANGO has signed a contract with DMPA which calls for production, sale and shipment to the United States of up to 26,250 tons of lead starting in 1954 and ending June 30, 1959. Huehuetenango is in remote Indian country of northwestern Guatemala, and is owned by two oil men from Houston, Texas—F. M. Corzelius and his brother C. F. Corzelius. One of their biggest problems is providing access to the mining area.

The company will spend $400,000 on a new 75-ton flotation mill, housing, roads, and mining facilities. It is developing two groups of mines and a smelter to produce lead bullion which, by the contract, must contain at least 98% lead and no more than 2% silver and impurities.

DMPA in return will buy the lead

Mining engineers specify Naylor Pipe because its exclusive Lockseam Spiralweld creates a light-weight structure with extra strength and safety built in for heavy-duty service. Write for Bulletin No. 507 and see how many ways Naylor Pipe can serve you...



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at the average New York market quotation (between the limits of 17.342 and 20.342 cents per lb.) less all shipping, refining and related costs.

Van Stone Gets Price Floor on Zinc Output

DMPA HAS AGREED to buy up to 18,500 tons of the first zinc produced from American Smelting & Refining Co.'s new Van Stone operation in Stevens County, Wash. The price: 15½ cents per lb., f.o.b. East St. Louis. The agreement terminates with 18,500 tons purchase of three years after the Van Stone starts to produce, whichever is first.

A. S. & R., in return, is building the 1,000-ton zinc-lead concentrator at a cost of $1,719,000, and expects to get it in operation in September of 1952. Production is expected to be 9,250 tons of zinc and 850 tons of lead per year.

Western U.S. Chosen for Kennecott Brass Mill

CHARLES R. COX, president of Kennecott Copper Corp., announced that his company's subsidiary, Chase Brass and Copper Co., will build a new brass mill in the West when it can get the steel. Construction would probably not be started in 1952, but might begin in 1953. Chase Brass is now surveying 11 Western states to choose the site. No final choice of the site has been made yet, he pointed out. But one governing factor in the choice will be railroad freight rates. Copper for the plant will come from Kennecott's new electrolytic refinery at Garfield, Utah.

Regarding the future of copper, Mr. Chase said that he foresees some substitution of aluminum for copper, but "the biggest substitution will be aluminum for steel." He added that the outlook is for an increase in the price of both copper and aluminum.

Denver-Dillon Vibrating Screens

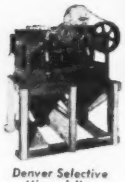
Denver SRL Pumps

Denver Steel-Head Ball Mills

Denver Cross-Flow Classifiers

DRIER FILTER CAKE with...

DENVER DISC FILTER

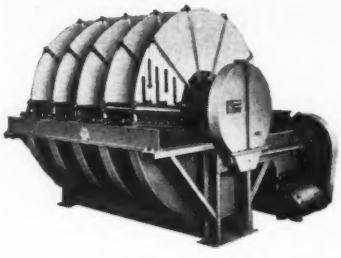

Denver Selective Mineral Jigs

Denver Ore Feeders

Denver-Buckman Concentrators

Denver Mechanical Gold Pan

See how drainage grooves in the filter segment run at right angles to the suction edge of the filter segment?



This patented feature on **DENVER DISC FILTERS** means positive drainage from each segment; no blow-back of filtrate into filter cake. **RESULT: DENVER DISC FILTERS** give drier filter cake.

SIZES: 2' x 1-disc through 6' x 8-disc and larger.

OTHER FEATURES: Divided tank permits filtering 2 products with same filter. Filter segment can be replaced while filter is in operation. Drive mechanism and valves are protected from dirt and slime. **DENVER DISC FILTERS are simple in design; simple to operate and maintain.**

FREE FILTER TESTS: DENVER EQUIPMENT COMPANY will conduct filter tests free of charge to determine proper size and type filter for your requiremnts. Write today!

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Philippine Iron Mines May Boost Production

EARL M. IRVING, a USGS geologist now on detail with the Philippines Bureau of Mines, predicts that the Philippine Iron Mines at Larap, Camarines Sur, may soon be able to increase annual production to one million tons, from the present 700,000 tons.

He likewise suggests that contracts with the buying countries, like Japan, should be on a long-term basis, say three to five years, so that the mines would be in a position to plan ahead for necessary capital expenditures. The biggest contract since the war was for 500,000 tons delivered to Japan in an eight-month period. The mines began producing in 1934, and except for the period from 1942 to 1947, have accounted for two-thirds of Phillippine exports to Japan.

IN THE UNITED STATES

ARIZONA

★**Conferences** were held in Phoenix which, if successful, will result in the immediate opening of a score or more of new manganese mines in the west central part of Arizona. Otto G. Klein, regional director, GSA, and J. H. East, Jr., regional director, USBM, Denver, conferred with Charles F. Willis, state secretary, Arizona Small Mine Operators Association and chairman of the Board of Governors, Arizona Department of Mineral Resources, relative to details of the program. The discussion centered around placing a government manganese purchasing depot at either Wenden or Aguila.

★**Charles F. Willis** feels this way about our manganese supply: "This country's experience of being dependent for manganese on foreign countries, such as Russia, then being cut off in time of urgent need "should

teach the powers-that-be that the resources in this country should be opened and available for use in time of such emergency. This is a doctrine that has long been preached by us but so far it has fallen on deaf ears and we are especially pleased to note even this belated recognition. Arizona has much to offer."

★**Manganese** in west central Arizona which might be opened by establishing a government purchasing station close to the area are: Black Diamond, Floyd Brown, Aguila; Stovall Manganese, Al Stovall, Phoenix; Black Bess & Little Dicky, Walling, Morrison & Frost, Quartzsite; Black Mesa, Rodgers & Neal, Wenden; Black Queen, Fred Seifert, Aguila; Purple Panzy, Lucien Smith, Aguila; Wisconsin Group, John House, Aguila; Pfsiflomelane, S. J. Love, Yucca; Black Jack, Roy Eaton, Wickieup; Black Hawk, L. A. Aplington, Bouse; Arizona Manganese Corp., F. A. Shannon, Wickenburg; Black Jim, Ada McGregor, Wickenburg; Black Diamond, Mark Hall, Kingman; Black Diamond, Claude Neil, Hackberry; Sambo Aguila, Dempsey Powell, Aguila; Black Jack California, Blythe Manganes , Blythe, California; Hart Manganese, Charles Hart, Bouse; Tate Manganese, Earl W. Tate, Yucca, and others.

CALIFORNIA

★**Walabu Mining Co.** is starting to develop its long-idle Cuddeback Mercury mine, according to word from Walter F. Buaas, president. The Cuddeback is near Keene, in Kern County. Mr. Buaas says "we intend to continue the tunnel until we strike the hanging wall and sink on same."

★**Under U.S. Tungsten Corp.,** Jumbo mine, about 14 mi. east of Independence, is developing into a major tungsten prospect. Ed Crigar is president of the company, which operates under a lease from Hazel Lund and Mrs. Betty Thompson. The mine produced rich gold ore back in the 1860's and 1870's, but tungsten wasn't discovered until 1941. Then, M. J. Thompson discovered scheelite in a lime-granite contact zone which extends for about 1,400 ft. Underground workings include a 110-ft. tunnel and a 160-ft. inclined shaft. U.S. Tungsten is stockpiling ore and is reportedly planning to build a mill at some later date.

★**Willow Valley Mines** has put a new electric locomotive into service in its main 3,000-ft. tunnel. The company, which in 1950 acquired several mining properties centering about 2 mi. east of Nevada City, has since rehabilitated a large footage of old workings. Also, it has picked up an extension of the Omega ledge at a depth of 300-ft.; John M. Hoff, president and general manager, reports that the ledge shows free gold and is expected to develop into an orebody of major importance.

★**H. C. Miller,** Regional Director of USBM, predicts that there will be a continuing shortage of tungsten for the next several years, and states that there's little likelihood that the floor-price will be withdrawn.

★**At the new Idria mine,** workmen are putting 100 daily tons of cinnabar ore through the furnaces. Idria Mining & Chemical Co., operating the mine, has rehabilitated it since 1951. The mine was a top producer in World War II, and folded after the war with the price of quicksilver. Over a period of years, the mine has been No. 2 producer in the United States. Now, with 65 men working (and more slated for employment if skilled miners are available), the New Idria has been rehabilitated on the 500 and 1,000 levels, and intervening stopes, and is again a major producer.

COLORADO

★**Gold and silver receipts** at the Denver mint were up in January from the volume of a year before. Receipts of gold in January, 1952 totaled 67,376 oz. worth $2,358,168, compared with 60,998 oz., worth $2,134,949 in January, 1951. Silver receipts were up to 201,067 oz. worth $181,929, from 15,366 oz. worth $13,777; the reason: accelerated operations by Kennecott

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Denver Disc Filters

Denver Hydroclassifiers

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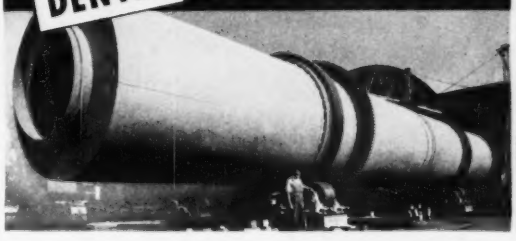

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Denver Pulp Distributor

Improperly Engineered Dryers Result in Low Drying Efficiencies or Lost Dollars to Your Company!

DENVER STANDARD DRYERS are engineered to meet **YOUR EXACT REQUIREMENTS** by men who know the drying business.

Preliminary estimates on the type and size **DENVER STANDARD DRYER** required to most efficiently dry your material will be submitted promptly without charge or obligation.

No drying operation too small; too large; too simple or too complex.

DELIVERIES. Our selling prices are competitive and yet we make excellent deliveries—usually better than 4 months on small and large units.

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Colorado *(Continued)*

Copper Corp. in Utah. The number of shipments received in January was up to 337 from 160 a year before.

★**Mint Superintendent M. E. Smith** said it is still difficult to acquire copper for making pennies, but that Mint authorities do not believe they will be forced to make the coins of other materials in the foreseeable future.

★**At Cripple Creek,** the first two carloads of ore have just been shipped from the Isabella mine, James Keener, superintendent in charge of operation, reports. One of the cars, which came from a raise driven on the Klondyke vein on the 7th level, settled for 0.525 oz. of gold per ton. The other settled for 0.24.

★**Increased production** and a program of expansion and improvement marked the year 1951 for Resurrection Mining Co. At its mill in California Gulch about 180,000 tons of custom, company and lease ores was milled during 1951. This was an increase of 25,000 tons over 155,000 tons milled during 1950.

★**Eagle mine and the underground mill** of the Empire Zinc Division of New Jersey Zinc Co. at Gilman were operated continuously six days per week during 1951. An average of 578 men per day were employed in all phases of the company's activities. Current production of zinc concentrates is approximately 5,500 tons per month.

★**Golden Cycle Corp.** reports the mill at Cripple Creek is now operating most efficiently, though there is a shortage of labor. Currently, the gold potential in the Cripple Creek and Victor areas, with the six mi. drainage tunnel completed and the modern 1,500-ton mill treating ore, is higher than at any time during the past 20 years.

★**Through 1951** in the Yak tunnel at Leadville, timber repair crews worked at replacing the old wooden sets with two-piece arched steel sets, bent and fabricated in the Resurrection shops from old 20 to 90 lb. rails. For lagging, war surplus steel landing mat is being used. About 1,500 of them have been installed. To prevent corrosion by the acid water, all steel posts from the Johnny switch to the portal were set in cement blocks cast in the company shop. Also, approximately half of the tunnel track has been raised six in. to get it out of the water. This will be continued to the tunnel portal during the coming year.

★The year 1951 saw continuation of a program of extensive improvements at the Arkansas Valley smelter of the American Smelting & Refining Co. at Leadville.

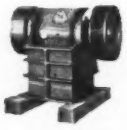
★**Colorado's output of zinc** in 1951 reached the top tonnage since 1917 and the top dollar value since recovery of zinc from the ores began in 1885. Lead production, increasing for the fifth consecutive year, was the largest in quantity since 1927 and, like zinc, established a new record for value. The gain over 1950 in quantity of zinc produced was 22% and lead 13%. Colorado output of gold last year declined 14% from 1950 despite re-opening of a number of gold mines in the Cripple Creek district after the new Carlton mill was started. Increase in Cripple Creek production of gold was more than offset by decreases in all the other important gold-producing districts except Leadville—decreases caused largely by lower average gold content of the complex ores mined. The average silver content of the complex and base-metal ores also declined, and output of silver decreased 20% from 1950.

★**Leasing partners,** John Hansen and Wilbur Wassaw, have discovered a rich vein of ore on the 7th level of the Cresson mine at Cripple Creek. Assays from the streak have sampled as high as 30 oz., according to the mine superintendent, Wesley Moulton.

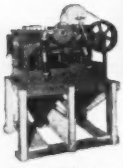
★**Climax Molybdenum Co.** produced at full mill capacity throughout 1951. The Stroke level, 300 ft. below the present Phillipson operating level, is being developed for high-tonnage pro-

Denver-Dillon Vibrating Screens

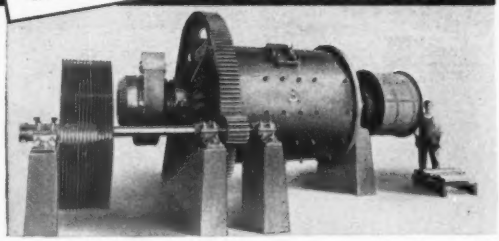
Denver Ore Feeders


Denver Jaw Crushers

Denver Disc Filters


Denver Selective Mineral Jigs

DENVER the Ball Mill with STEEL HEADS



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duction as rapidly as possible. A new primary crushing plant will be constructed near the portal of the Stroke tunnel. Crushed ore will be carried by a 4,700-ft. conveyor to the Climax mill. Capacity of the mill itself is being increased to 20,000 tons.

★**Crews have completed the Leadville drainage tunnel.** The Bureau reports the tunnel and laterals driven over 2 mi. at a cost of $2-million has unwatered many of the once famous lead-zinc mines of the Lake County area.

★**Major Ellis P. Lupton** who operates the Grizzly mine near Silver Plume displayed a powder box filled with high-grade lead ore, at the monthly meeting of the Clear Creek Mining Association. He says the vein will run about seven ft. wide.

★**Colorado Standard Lead Zinc Mines, Inc.** is reportedly approaching the production stage at its property 2 mi. west of Lake City. It is a consolidation of three old properties, the Ute, Ule and Hidden Treasure, and is backed financially by R. R. Wilson, of Santa Barbara, Calif. and Lucky Tiger Combination Gold Mines, of Kansas City, Mo.

★**The gold dredge** in the Fairplay placer field has been temporarily closed down. Webb Skinner, manager of the South Platte Dredge and operator of the big gold boat, in explaining the shutdown says: "it is obvious that one cannot spend more than one takes in for indefinite period of time, except in the case of Uncle Sam, and remain solvent.

★**A deposit of cobalt** was discovered during the autumn months of 1951 in the region north of Molas Lake, west of the Animas River canyon in the San Juan. Fred Olsen and Bing McGue, who discovered and staked the deposit had spent several months prospecting the region. Government representatives, so they claimed, were interested enough in the discovery to visit the scene and offered to okay a $10,000 U.S. loan to be repaid from production.

★**Underground operation** in the Henry Adney mine at Cripple Creek will probably start within 30 days, it was announced by Earl Robush and his brother who lease the Adney from the International Mining Corp. They have been busy the last weeks installing a hoist and compressor.

DELAWARE

★**No fatal accidents** for the year 1951 in underground operations in Houghton County Mines were shown in the annual report of the inspector of mines. It was the fourth consecutive year without a fatality.

★ **At Newport, Delaware,** the Du Pont Co. is producing about 1½ tons of titanium metal daily. By the end of 1952, the company expects to raise that figure to 2½ tons per day. In 1951, Du Pont produced about 400 tons, nearly 60% of the nation's 700-ton output.

Watch titanium! Ed.

IDAHO

★**Lookout Mining Co.** has reopened its caved lower tunnel workings in the Pine Creek area preparatory to a diamond drilling campaign in an effort to locate the Lookout Mt. vein which it is believed the old operators did not reach. The mine formerly shipped a limited tonnage of high-grade carbonate ore from upper workings.

★**After following a seam of ore** for 100 ft. Hypotheek discovered a vein of ore some 30 ft. wide by probing the footwall with long drill steel and is now driving a crosscut to the showing. The ground, recently purchased from King of Pine Creek, is called the East Hypotheek. The vein is believed to be an extension of the Hypotheek vein, of zinc and lead.

★**Sullivan Mining Co.** is driving a new adit into its Star mine from Burke toward Mullan, a distance of between 8,000 and 9,000 ft. The adit will be on a level with the Star ore-bins at Burke and will be 9x11 ft. in the clear; it will connect on the east

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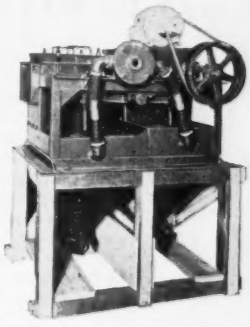
Prove to yourself the advantages of recovering mineral as soon as free *and before you grind H---* out of it! Send a 100 pound sample of ball-mill feed and $30.00 to: Denver Ore Testing Laboratory, Denver 17, Colorado. Please sketch present flowsheet and give tonnage. Products of Denver Jig Test will be returned to you for assay. If you are not satisfied there will be no charge. You are the judge.

Tests of this nature have discovered amazing recoveries that reduced over-all milling costs.



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Idaho *(Continued)*

end with the big hoist recently installed in the Star, doing away with the Hecla hoist at the west end, which now hoists Star ore 2000 ft. through the Hecla shaft. Underground haulage cost will be about the same, but the new adit will save the cost of maintaining and operating the Hecla hoist and the cost of transferring ore from one system to another. The new adit should pay for itself, in ten year's time.

★**Mascot Mining Co.'s** receipts for 1951 totaled $222,000 after payment of royalty to Pine Creek Lead-Zinc, owner of the property. New development work for the year consisted of sinking the shaft 300 ft. to the Nos. 9 and 10 levels. The No. 9 level has been opened by drifting a distance of 477 ft., north and south. The north drift has been in ore for 266 ft. and at one point the orebody was 10 to 13 ft. wide for a distance of 80 ft. and averaged 6.4% zinc, 2.8% lead, 0.9 oz. of silver and 0.05 oz of gold. The south drift was in relatively barren ground for 211-ft., but another ore shoot is expected within the next 150 ft.

★**Golconda Lead Mines** shipped 5 cars of lead and 2 of zinc concentrates in one week according to Superintendent Wray Featherstone. Past smelter returns on two cars of lead would indicate that the shipment will average $13,500 per carload, totaling $67,500, and the zinc $5000 per car, making a grand total of $77,500 for the entire shipment of concentrates from 3300 tons of stockpiled ore.

The old wooden flotation cells in the Golconda custom milling plant are being replaced by mechanical type cells.

Recent bulldozer work on the eastern section of Golconda ground has encouraged the company to do new deep development work in an easterly direction. Also the old Golconda shaft has been unwatered to the 1800-ft. level; from there a drift will be driven easterly to explore the Golconda vein, East Mayflower veins and the Square Deal vein.

★**Lucky Friday Silver-Lead Mines** has received net smelter returns of $272,000 for a shipment of 18 cars of lead concentrates and two of zinc. The company is currently producing 100 tons of ore per day and preparing for extensive development work from the 2000-ft. level. The mine is largely unprospected: Work is being confined to one vein system which on the 2000-ft. level shows a length of over 500 ft. and a width approximating 8 ft., half of which is solid ore. Some development work on higher levels indicate three parallel vein systems in Lucky Friday ground and at least one vein system in Lucky Friday Extension ground to the north. All of these possibilities will be thoroughly prospected from the 2000-ft. level.

★**Idaho Custer Mines,** a reorganization of the old Custer mine in Southern Idaho, recently installed a mill, which started Nov. 5 on feed from the old mine dump left by former operators; that operation yielded $190,000 worth of lead-zinc concentrate up to the end of 1951, Harry P. Pearson, president, reports. In the meantime the company is reopening the old mine and will sink to deeper levels.

★**During 1949 USBM** reported that its diamond drilling investigations in Idaho and Washington indicated 200,000,000 tons of alumina clay deposits. Drill hole data was made available on five deposits in Latah county, Idaho, and others in Cowlitz, Pierce and King counties, Wash. The Bureau is now asking congress for an appropriation of $1,000,000 to test processes of extracting aluminum from anorthosite rocks and clay deposits near Laramie, Wyo., where vast deposits are reported to exist. J. J. Forbes, Bureau director, is reported to have told the House sub-committee that:

"Despite extensive exploration for bauxite in the United States, the known domestic reserves of bauxite ores are inadequate to supply the American aluminum industry.

"The only way of avoiding increased dependence on foreign sources is to develop a satisfactory technology for recovering aluminum from clays, anorthosites and other aluminous rocks that occur in abundance in the United States."

★**Hecla Mining Co.** is the only company in the Coeur d'Alene district not organized by the Mine-Mill union, though the union has made several attempts. Latest was at the company's Silver Summit and Polaris mines, where a consent election was held under direction of NLRB. The vote was 77 to 25 in favor of the company with 102 of the 109 employees voting.

★**Westvaco Chemical Division** of Food Machinery & Chemical Corp. has established a mineral development department at Pocatello. Manager of the new department is O. A. Power, formerly with J. R. Simplot Fertilizer Co. He will be assisted by H. B. Fowler, Ace Allen and W. C. Peters, geologists; and E. L. Spencer and W. A. Young, mining engineers. It is understood that a first goal will be expanded exploration and production of phosphates.

★**S. K. Atkinson,** a mining engineer with dredging experience, has explained a proposed huge Snake river dredging project to the Weiser Chamber of Commerce. The Chamber decided to sponsor the plan before the Idaho State Land Commission in Boise.

As outlined, the plan would be privately financed and would have for its objective the recovery of an estimated $171,000,000 from the Snake River bottom on both the Idaho and

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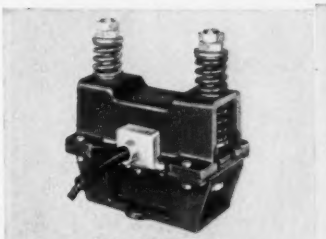

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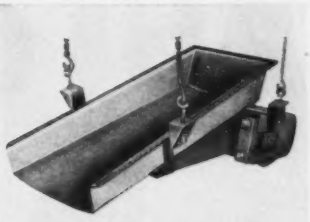

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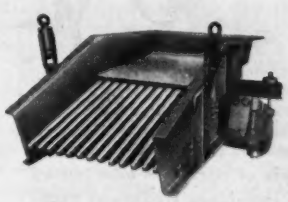

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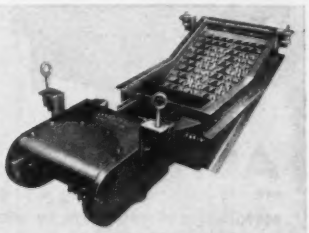

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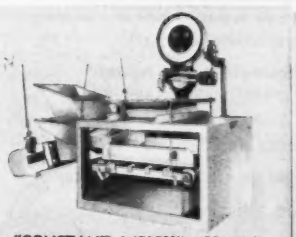

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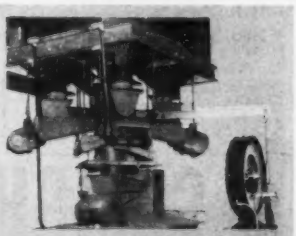

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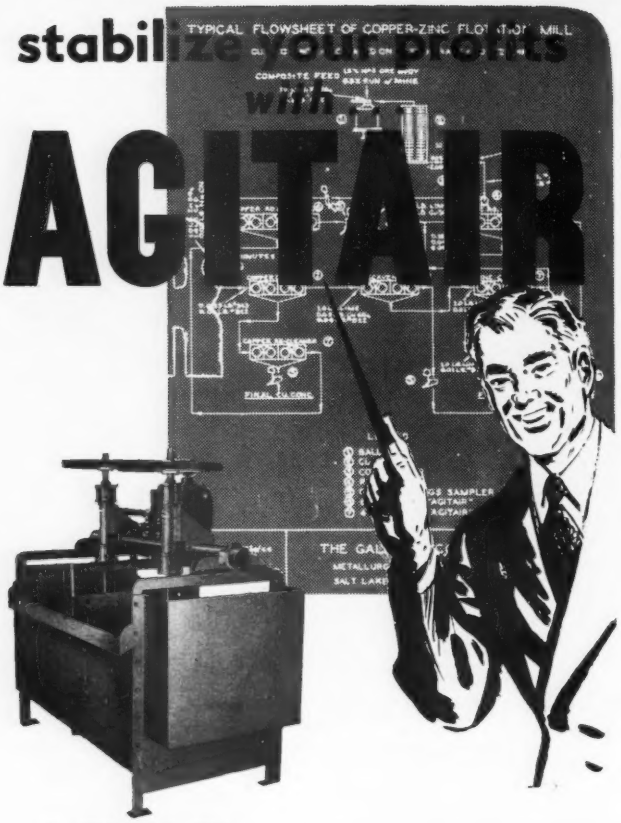

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Idaho *(continued)*

Oregon sides of the river between the towns of Weiser and Robinette. The job would extend over 18 years and would employ about 250 men. Atkinson estimates the tonnage and values, to be recovered by 10 dredges operating 24-hours per day, as follows: Every 10,000 yd. of placer gravel yield an estimated 50 tons of concentrate worth $3,250. The concentrate would contain 3% monazite, 1% zircon, 10% garnet, 5% chrome, 1% uranium, 34% ilmenite, 46% magnetic iron and fine and coarse gold worth 12½ cents per cu. yd. He estimates operating costs at 18 cents per cu. yd. and net profits at 14½ cents per cu. yd. or $1450 per operating day.

★**A new grinding plant** is being installed at the Bunker Hill Smelter, according to P. C. Fedderson, superintendent. The plant, being built and installed by the Stearns-Roger Manufacturing Co. of Denver, has a capacity of 60 tons of ore per hour. Construction of a plant to recover sulphur from waste fumes at the smelter and the Sullivan electrolytic zinc plant are still under consideration, Fedderson said.

★**Clayton Silver Mines**, near Salmon, Idaho, is deepening its shaft from the 400 to the 600-ft. level. Stoping operations at the rate of 90 tons daily have proved the downward extension of a wide ore zone. Norman Smith is resident engineer.

★**Goldstone Mining Co.**, developing a gold prospect near Salmon, Idaho, has acquired a half interest in the War Eagle silver-lead property one mi. west of the Goldstone and plans to develop a promising vein of ore on a 50-50 basis.

★**United Mercury Mines** has reopened the Hermes quicksilver mine, adjoining the Bradley Yellow Pine mine at Stibnite, Idaho.

★**Sinking at the Spokane-Idaho** property on Pine creek is now near the 2000-ft. level. The vein has been opened on the 1600-ft. level and some stopes have been started, but most of the company's production is coming from above the 1400-ft. level. Production is 185 tons of ore per day. A new Coeur d'Alene hoist was recently installed but is operating at only half capacity because of delayed delivery of one of the 100-hp. motors required for operation at full capacity.

KENTUCKY

★Installation of a Heavy-Media separation plant at its Mexico, Ky., property is planned by U.S. Steel Co., Fluorspar Division, according to R. R. Estill, general superintendent. Contract has been signed with Southwestern Engineering Co., of Los Angeles, for construction of the "two-package" unit which will require ap-

proximately 12 months, depending on delivery of equipment. Foundation work will start immediately. Capacity of the new plant on an 8-hour basis will be 140 tons of concentrates. Two classifiers, instead of cones, will be used in the separation process. Three products, sink, float, and middlings, will be made. Middlings will be ground and sent to the flotation plant for separation of fluorspar, zinc, and lead.

★**Partnership** of J. Willis Crider and William H. Crider, Marion, Ky., fluorspar operators, has been dissolved. The former will handle Kentucky properties while the latter will deal with Mexican fluorspar exclusively.

MICHIGAN

★**Logging contractors** are removing the timber from the White Pine Townsite in Ontonagon County, where the Copper Range Co. plans a community of 3 to 5,000 people. Actual construction is expected to get under way in the spring. The proposed power house, first planned for a site near the mouth of the Ontonagon River, now is to be located near the mine property.

★**Work at the Tracy mine** of the Jones & Laughlin Ore Co. is progressing well in spite of the difficulties of winter construction. The Worden-Allen Co. of Milwaukee has completed the steel framework of the hoisthouse, and foundations for the man hoist and ore hoist are in place.

★**Peterson mine**, operated by Pickands, Mather & Co. and owned jointly by Youngstown Sheet & Tube Co. and Bethlehem Steel Co., is made up of the old Puritan, Ironton, Yale and Colby mines whose history goes back more than 65 years. (Your correspondent made a "holing through" survey at the Ironton shaft in 1903.) Shaft sinking is being carried on at the Puritan shaft, to serve the Peterson, and a small shipment of 11,144 tons was made in 1951.

★**The decreased tonnage** of iron ore handled by Ashland, Wis., docks in 1951—2,739,161 tons as compared to 4,897,393 tons in 1950—reflects the tonnage which was diverted to Escanaba, Mich. Reason: the shorter lake haul from Escanaba and, consequently, the time saved in making the lake round trip.

★**A skip which dropped** to the bottom of North Range Mining Co.'s Warner mine shaft on Feb. 4 required several days of hard work by a crew of maintenance and production men before it was released from the muck at the bottom of the shaft.

★**A four-ton electric locomotive**, which had been brought up for repairs, dropped 1200 ft. in the Fogarty shaft at Pickands, Mather & Co.'s Buck mine and tied up operations for two days. The falling locomotive did some damage to the shaft. The Berkshire

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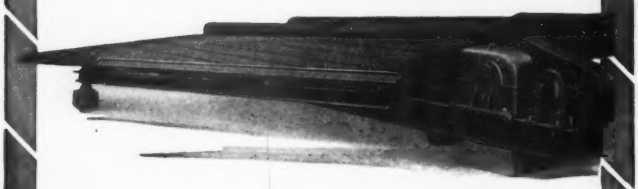

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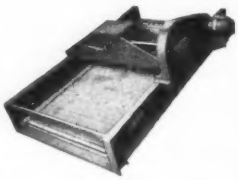

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Michigan *(Continued)*

shaft, ½ mi. northeast, was used for access until the Fogarty shaft was repaired. Miners were taken by truck from the Fogarty dry to the Berkshire shaft cage and then by electric locomotive to their working places.

★**Hearings are being conducted** in Lansing on a bill which would remove mine inspection from county supervision and make it the responsibility of state inspectors who would be under civil service requirements. CIO representatives from the iron and copper areas have appeared in support of the bill.

★**A maintenance mechanic** was killed at an Iron River mine when the skip he had entered at the shaft collar dumped and plunged him 1,100 ft. down the shaft.

★**Bristol mine employees** staged a two-day walkout in protest of a rule prescribing a penalty for those who fail to telephone the mine office on days when they are to be absent. A penalty of one-day layoff had been imposed against a miner who had failed to so report, did not appear for work, and did not telephone until about 3:30 pm of that day. The matter was taken up through regular grievance channels after the men had returned to work.

★**M. A. Hanna Co.** was largest shipper from the Menominee Range in 1951. It forwarded 1,949,336 tons of which the Homer, Hiawatha and Wauseca mines furnished the main part. Pickands, Mather & Co. was second with 1,275,699 tons of which the Buck group (largest shipper from the range) contributed 638,482 tons. Inland Steel was third in the Menominee list at 691,905 tons and the Sherwood mine was its largest shipper, 499,619 tons. These are all underground mines.

★On Feb. 9, the Gogebic Range Engineers Club held its annual meeting at Ironwood. Officers elected for the next year are: A. L. Johnson, superintendent of Pickands, Mather & Co.'s Cary mine, president; A. J. Wagner, Gogebic Range safety supervisor for the Oliver Iron Mining Division, vice president; and W. M. Somppi, Cleveland Rock Drill Co. representative, reelected secretary-treasurer.

★Up to January 1, 1952, M. A. Hanna Co.'s Wauseca mine has shipped a total of 4,073,127 tons. The mine is 1239 ft. deep and is comparatively dry. Most present operations are from the 9th level, but plans are being made to open up a 10th level which will connect with the Minckler mine, also controlled by Hanna.

★**On Februray 13th,** 80 underground miners employed at the Sunday Lake mine of Pickands, Mather & Co. at Wakefield, walked out on a wildcat strike to protest against the system of using three miners to operate two places. They said that, because this

leaves one man to work alone for a part of the shift, it was unsafe. Most of the miners returned to work on the 16th, and the others returned on the 18th. Union officials urged the men to resume work. The matter will come up in the usual grievance manner.

★**Underground belt-conveyor systems** are carrying ore to the shafts in two Inland Steel Co. mines in the Iron River district: the Sherwood, which has been installed for sometime, and the Bristol, a recently completed installation following the lines that have worked out well at the Sherwood.

★**Minor construction** at the White Pine property in Ontonagon County will be started this spring, but work on major projects will not start until plans in blueprint stage are fully developed, a matter of probably five months. A total of 162 engineers will be employed by the Copper Range Co. on plans and drawings.

The mine is to be in production two years and eight months from the time major construction begins, according to an official announcement. The previous deadline was three years. From 800 to 1,200 will be employed at various times in readying the property. Eventually a new town to be built at the site, will have a population of approximately 2,500. The company expects to build 200 housing units each in 1952. , '53 and '54. Three large dormitories will be constructed for single workers and will later be converted to apartments.

The proposed power plant, to cost $13,000,000, will be built at White Pine, according to present plans. It is still possible the plant may have to be located at the mouth of the Ontonagon River to insure adequate water supplies.

The procurement contract between the government and White Pine Copper Co., a subsidiary of the Copper Range Co., which was signed recently in Boston, calls for purchase by the government of 243,750 short tons of copper over a 10-year period, dating from beginning of production. The basic price will be 25½¢ per lb. The contract has an escalator clause under which the price will be adjusted up or down according to fluctuations in the U. S. Bureau of Labor Statistics cost of living index.

★**Montreal mine** of Oglebay, Norton & Co. at Montreal, Wis., again beat the million-ton mark in 1951 with 1,133,234 tons. Montreal and Steep Rock, during the past five years, have each produced more than 5½-million tons with Steep Rock now leading by only 61,000 tons.

MINNESOTA

★**Oliver Iron Mining Division**, with a total of 43,992,961 tons from the Lake Superior area, produced over 45% of the approximately 96½-million tons that came from the area in

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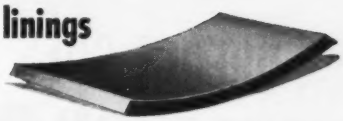

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46.

Minnesota (*Continued*)

1951. Largest shipper was the Sherman group—8,556,115 tons—with the Rouchleau group in second place. The Hull-Rust at Hibbing, Oliver leader for many years, slipped to third place with 5,787,727 tons.

★Only Cleveland-Cliffs property to contribute 1-million tons or more to the company's Lake Superior shipments of 9,070,935 tons, was the Mather mine on the Marquette Range at 1,555,766 tons. The Holman-Cliffs at Taconite had 958,393 tons and the Canisteo at Coleraine, 922,285 tons.

★**Pickands, Mather & Co.,** long in second place among Lake Superior shippers, with 14,317,634 tons, was only 640,430 tons ahead of the M. A. Hanna Co. in 1951. The two companies, with a total of 27,994,838 tons, provided 29% of the Lake Superior area production. The old reliable Mahoning mine was first in P.M.'s list at 3,454,649 tons, more than double the shipments from the Embarrass mine in second place with 1,480,733 tons. During its 53 years of operation, the Mahoning has shipped a grand total of 102,689,276 tons, a figure exceeded only by the Hull-Rust, its neighbor, which is far in the lead with a total, during its 55 years, of about 200-million tons.

★**A group of Minnesota men** which includes E. W. and J. F. Hallett of Crosby, J. F. Lorge of St. Peter, and R. N. McGiffert of Duluth, have organized the Brunswick Silica Co. The company will operate an open pit mine and build a plant at Brunswick, Ohio, to produce a metallurgical gravel for steel plants and sand for glass manufacture.

★**Pacific Isle Mining Co.** shipped 372,929 tons of iron ore in 1951 from 18 leases, most of which had been "exhausted" by former operators but were revived through use of improved beneficiation processes.

★**Pickands, Mather & Co.** is stripping its new West Hill mine on the western Mesabi, between Coleraine and Grand Rapids.

★**J. & L.'s Minnesota Ore Division** is preparing to strip the Lind-Greenway property (about 5 mi. east of Grand Rapids) in the spring. The two mines will form a single operation with a total estimated tonnage of about 5½-million tons. The Greenway was opened in 1940 and has shipped 868,449 tons while the Lind is a new operation. A bridge will be built across the Prairie River and mine buildings will be on the Greenway; Lind ore will be trucked over the bridge to the plant. Ore shipments are scheduled for 1954.

★**Five subcommittees** of the Minnesota state legislature have been appointed to make studies on various phases of the iron ore industry as it affects Minnesota. The committees are to report on the following subjects: (1) the quality and extent of Minne-

sota iron ore reserves and competitive reserves elsewhere; (2) the cost of mining and developing Minnesota iron ores and competitive ores in other parts of the world; (3) the advisability of using the Lake Erie price as a tax base and to obtain other pertinent tax data; (4) to study the impact of national defense and (5) to study the possible effect of the proposed St. Lawrence waterway on Minnesota's iron mining industry. A fund of $150,000 was allotted for these studies.

★**Cleveland-Cliffs Iron Co.** has closed its Wanless mine at Kinney for the winter, excepting 20 men, who remain for repair work. The mine had been operating three shifts, six days per week. It had been idle from 1928 until about two years ago, but shipped 281,613 tons in 1951, and will reopen soon.

★**Stripping at** Snyder Iron Mining Co.'s Whiteside mine at Kinney, which had been done by the Al Johnson Construction Co. of Minneapolis, is now being carried on by Snyder. Most of the men employed are from the Virginia mine, where the company has given up its lease, and the Shenango.

★**Minnesota Geological Survey** urges that further exploration work be done to determine whether the nickel-copper indications reported last summer near Ely are of sufficient extent to make mining feasible. Dr. George M. Schwartz, professor of geology at the University of Minnesota, said tests made "are believed to . . . warrant extensive exploration work to determine if a body of mineable ore exists."

★**Republic Steel Co.** has been stripping at its Stevenson mine, west of Hibbing, since the close of shipping last fall. Operations are on a three-shift, six-day-per-week basis.

★**A new method** of determining how iron ore will react in a blast furnace has been developed at the University of Minnesota Mines Experiment Station. Carl Wood, chief of the Regional Metallurgical Division, U.S. Bureau of Mines, explained that the process involves the loss-in-weight method and can be completed in a few hours. Work on the method was begun in 1946, and has now reached a stage where samples are being received from all over the country. Wood says the test has resulted in more efficient blast furnace operation and conservation of coke.

★**An order** from Chester S. Wilson, state commissioner of conservation, has been filed with the St. Louis county board granting the Oliver Iron Mining Division permission to take an average of 1200 gpm from West Two Rivers for the taconite plant being constructed at Mt. Iron. The project provides for constructing a dam near the confluence of the east and west branches of West Two Rivers and maintenance of a reservoir north of the dam. The dam will be 20-ft. wide at the top and not less than 120 ft. at the bottom. Return

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Minnesota *(Continued)*

water from the tailings basin and water from the Mt. Iron, Snively, and Iroquois mines will be pumped into the reservoir. No industrial pollution may be found in water returned and the order forbids the company to deprive Mt. Iron village of its water supply.

MONTANA

★**U. S. Gold Corp.**, operating in the Tobacco Root Mountains, 12 mi. northeast of Twin Bridges, has opened a 4-ft. vein of gold ore in a 2,000-ft. crosscut tunnel at a considerable depth below the main workings. It is reported that the company has ordered $25,000 worth of machinery to increase its 250-ton mill, and plans to go into production sometime this year. A. Pat Clark, formerly of Spokane, Wash., is vice president and resident manager.

★**Sunlight Mining Co.**, which operates the Moonlight mine near Maxville, has contracted to sell 10,000 tons of phosphate rock to Consolidated Mining & Smelting Co., Ltd. of Canada, according to Wellman Clark, secretary of the Sunlight Co. Production will start later in the spring.

NEVADA

★**Contract has been let** to Silver State Construction Co. for building a 20-mi. mine access road to the Nevada Scheelite property from a point on U.S. 50 near Frenchman's Station. The Nevada Scheelite Co. is the No. 2 producer of tungsten concentrates in Nevada, out-ranked only by the Nevada-Massachusetts Co. Several other tungsten properties in the Rawhide area will also be served by the new road.

★**Manganese Ores Co.** has made a request for 16 acres of ground in the vicinity of Hoover Dam for 80 new homes to houseworkers at its $600,000 manganese plant. The plant is expected to start operating within the next few months, and will employ 150 men initially.

★**C. G. Brailey**, superintendent of the Charleston Hill National Mining Co.'s Black Diablo Mine, reported a 75-ft. ledge of high-grade manganese ore uncovered on the site 21 mi. south of Golconda. A new building has been completed at the property to provide living quarters for personnel. Development work continued all winter. It is expected that the company will resume shipping a carload of ore daily as soon as haulage roads become passable. O. H. Hubble, of Atlanta, Ga., is supervising open-pit operations under contract.

★**Sodaville tungsten mill** 3-mi. south of Mina is now in operation treating ores for the Nevada Tungsten Corp.

The plant has been redesigned and enlarged to make it capable of handling custom as well as Nevada Tungsten ore. Capacity has been increased from 100 to 200 tons of ore daily. Its central location is expected to eliminate long hauls to mills for several of the smaller tungsten producers in the area.

★**Dutch Flat Mines Inc.** has purchased the old Western Pacific roundhouse and adjoining buildings at Winnemucca, and moved them 25 mi. north to its mining property. The lumber is being used to construct a placer mill and living quarters for the personnel. A 5-in. water line has been completed for 3 mi. and full-scale operations are due to begin as soon as weather permits. Dutch Flat claims lie in the bottom and along the sides of Idaho Gulch in the Paradise mining district. Surface samples taken by Nicholas Crawford, consulting engineer, vary between .11% and .2% mercury, and underground samples run as high as .53%.

★**Lippincott Lead Co.** has completed final changes at its smelter at the Bonnie Claire property in Nye County, about 30 mi. south of Goldfield. The smelter was moved from Santa Ana to its present site. First trial run was made early in February, at which time 27 tons of lead bullion were produced and trucked to Santa Ana for use in battery manufacture. Operation of the smelter was faulty due to insufficient air capacity of the blower system, but that has been corrected. Lippincott Lead Co. owns and operates the Sun Battery Co. and Nic-L-Silver Battery Co. at Santa Ana. The ore being treated at the Bonnie Claire mill is from a stockpile produced by its Lead King Mine in Nye County.

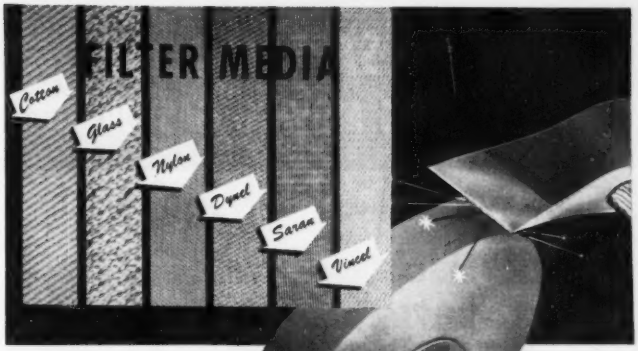
★**Gabbs Exploration Co.**, which owns the Victory Tungsten mine and operates a 100-ton mill at Gabbs, is treating 80 tons of ore daily and expects to step up operations when the weather permits.

★**At El Capitan Tungsten** mine, Gordon and Lindsay Smith are now running 20 tons of ore daily through the 50-ton mill. Their mine is 6-mi. northeast of Gabbs.

★**Minerva Scheelite Mining Co.**, Minerva Hill in White Pine County, is milling about 10 daily tons of ore from the Scheelite Chief mine. Robert Stopper is the general manager.

★**Molybdenum Corp.**, has purchased acreage at Henderson from the Colorado River Commission and plans to build a processing plant for rare earths from its Mountain Pass mill.

★**New World Exploration, Research and Development Corp.**, John Uhalde and Rhoads Grimshaw, have started shipping iron ore to Japan from Stuart Welter's McCoy Iron Mine at Battle Mountain. New World had previously carried out geological, geophysical



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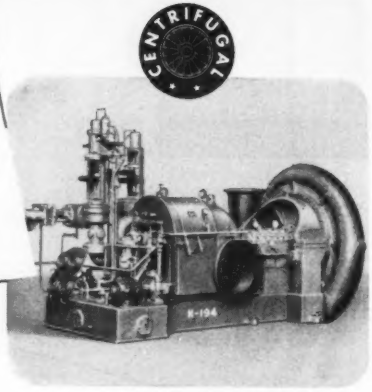

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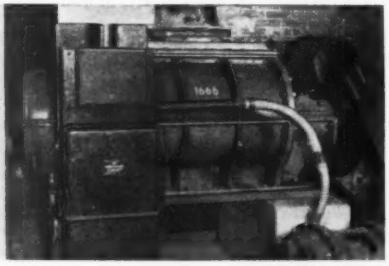

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Nevada *(Continued)*

and drilling work, and blocked out a good tonnage of high-grade ore.

NEW MEXICO

★**A notable increase** in iron ore shipped from scattered districts in New Mexico to Colorado Fuel & Iron Co. at Pueblo, Colo, has taken place in the past year. Most recently, three producers, J. D. Close, Robert Robins and Frank S. Hall, began shipping from north of Carrizozo, from Copper Flat near Central, and from the Tecalote district south of Corona. Sixty thousand tons will be delivered as a trial run. The Boston Hill mine at Silver City ships 80,000 yearly tons of ferro-manganese ore.

★**Lively development** is going on among the lead-zinc producers of Grant County. U. S. Mining, Smelting & Refining Co. is sinking shafts at its Bullfrog and Princess mines to 2,000 ft. At that depth the shafts, 6,000-ft. apart, will be interconnected. American Smelting & Refining Co., Peru Mining Co. and Kennecott Copper Corp. are also doing extensive development work.

★**Near Santa Fe,** the Tom Payne mine, operated by Santa Fe Lead Zinc Mines, Inc., and the Pennsylvania mine, operated by Verne Byrne and Dick Leigh, are shipping ore. Richard McGhee, president of Santa Fe Lead Zinc Mines, Inc., says ore from the district is worth $80 per ton at the mines. His company has a 25-ton mill ready for operation and a 100-ton mill under construction.

★**For Duval Sulphur and Potash Co.** construction of permanent hoists for ore and personnel has been started by Stearns-Roger Co. of Denver, Colo. The refinery was recently completed. Since midwinter, the company has been producing on an experimental basis with original development equipment.

★**F. E. Schundler & Co.,** of Joliet, Ill., and Long Island City, N.Y., is shipping perlite from an operation at No. Agua, 35 mi. northwest of Taos. Schundler's shipments are going to the firm's Joliet and Long Island plants via railhead at Antonito, Colo.

★**Ground is being cleared** for Anaconda Copper Co.'s uranium processing plant near Grants. Potential production of ores is increasing as exploration widens in the area. A prospecting agreement has been signed between the Acoma Indian tribal council and F. A. Sitton, of Dove Creek, Colo. Acoma, the "sky city," is south of the Laguna pueblo territory where Anaconda is prospecting.

★**A big increase** in leasing and mining operations on the Navajo reservation is expected with the recent approval by the Bureau of Indian Affairs of relaxed tribal controls under

which Indians may transfer lease rights to non-Indians. Hitherto, every lease had to be in the name of an Indian.

★**Correction:** Mrs. Maude J. Fowles, sole owner of the American mine, tells us there's no truth to the item in January, *E&MJ*, which stated that Sidney M. Weil had optioned the property and was planning to develop it.

NORTH CAROLINA

★**Baron Mica Mining Corp.**, Spruce Pine, has been issued a certificate of incorporation by the Secretary of State. The company will mine and process mica. Authorized capital stock $40,000, subscribed stock $900 by Henry Grindstaff, Celo; Cecil Phillips, Wing; and John C. McBee, Bakersville.

★**Francis C. Bourne**, Asheville contractor, was the low bidder Feb. 20 on a contract to build a new mica processing plant for Southeastern Mica Co. at Mitchell. Bids were opened at RFC's Charlotte offices. Bourne's low bid was $32,000.

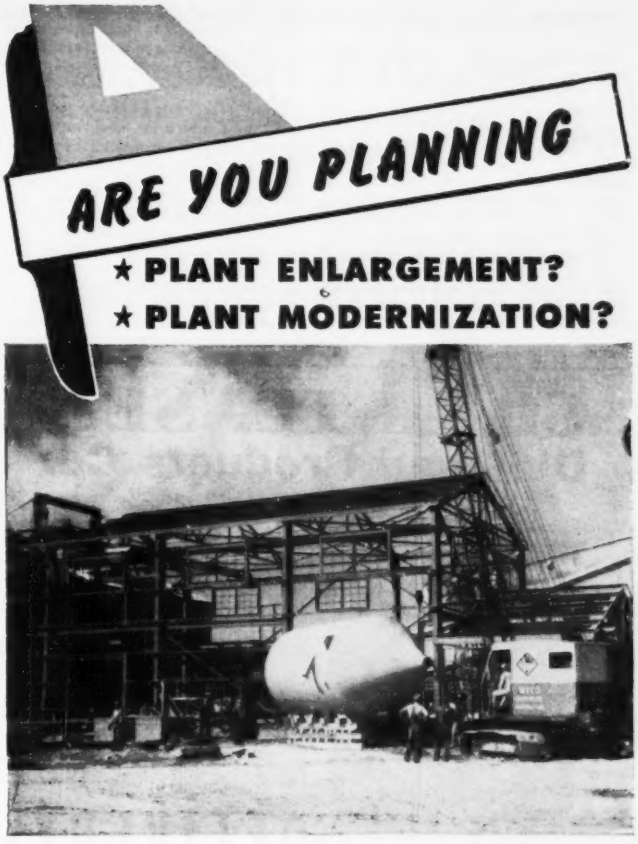
OREGON

★**Ashland Mining Co.** has started mining operations at the Mattern tungsten deposit on the Southern Pacific right-of-way 1 mi. northwest of Ashland. The ore zone, as now exposed, has a maximum width of about 12 ft. Initial mining is by open-cut methods, and concentration will be at the company's mill west of Ashland.

★K. G. Murry and Burt S. Hayes have sold their lease on the Standard claims at Quartzburg to Ray E. Summers. (The Standard has been a producer of high-grade gold-cobalt ore.) Summers plans to start development early this spring. Mr. Hayes, the seller, is going to start milling chrome ore and shipping concentrate to Grants Pass.

TENNESSEE

★**Ruhm Phosphate & Chemical Co.**, Columbia, has begun operation of its new raw-ground rock phosphate plant, on a 35-acre site formerly occupied by the Franklin Limestone Co. in the south part of that city. The new plant is owned by Oliver M. Babcock, formerly an officer of Hoover & Mason Phosphate Co. of Mt. Pleasant which is now in process of dissolution. The Ruhm Co., one of the State's oldest phosphate processors in recent years had obtained its ground phosphate from the H. & M. plant at Mt. Pleasant. Full production at the new Columbia plant will not be reached for two months; 45 persons are cur-



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Tennessee *(Continued)*

rently employed. Bruce Huff is plant manager.

UTAH

★**Searls Brines, Inc.** of California is exploring the Escalante Valley region of Iron County, Utah, for commercial deposits of sodium and potassium nitrate, according to company President Olin Welborn. Exploration had, by late February, uncovered "significant" shows of the nitrates apparently deposited by hydro-thermal action. However, while a "major chemical firm has shown interest" in the deposits, no reserves have as yet been established. Searls Brines is conducting its search on about 5,000 acres of state and federal leases.

★**A "joint enterprise block"** of ground in the Park City district being explored by Silver King Coalition Mines Co. and Park Utah Consolidated Mines Co. may become a most important producer of ore, according to James Ivers, vice president and general manager of Silver King. The block produced 13,270 tons of ore in 1951, with the Silver King share set at 5,535 tons, the company's report notes. Exploration in the joint ground is expected to be pressed vigorously. Ivers reported that development work in Silver King ground in 1951 totalled 5,748 ft. plus 532 ft. of diamond drilling. The company mined 39,337 tons of lead-zinc-silver ore during the year. Silver King Coalition's net income was set at $61,013 for 1951 as against a 1950 net loss of $81,223.

★**Metal Producers Inc.,** lessees operating the Horn Silver Mine in Beaver County, resumed milling operations in late February after extensive mill changes and mine development work. Mining and milling were reported at the rate of 100 tons per day on a single-shift basis, with a 200 ton daily output planned when crews for two shifts become available, according to Manager D. C. Peacock. An eventual 300 to 400-ton daily output is believed possible with both lead and zinc concentrates being shipped. Lead output is being sent to Salt Lake City for smelting, while zinc output is going to Montana.

★**Garfield Chemical and Manufacturing Co.,** a joint subsidiary of American Smelting & Refining Co. and Kennecott Copper Corp. plans a $2.5-million addition to present sulphuric-acid production facilities at Garfield. The expansion will boost sulphuric acid output 250 tons a day. When the addition is placed in operation in 1953 Garfield's total sulphuric acid output will be 700 tons daily.

The construction contract has been awarded to Leonard Construction Co. which last year completed a $7-million expansion and renovation of the old Garfield acid plant. Garfield has been granted a certificate of necessity for the addition which will be a fourth unit of the existing acid plant. Construction plans call for a drying unit, vanadium pentoxide concentrators and absorbing units.

★**Kennecott Copper Corp.** will spend $500,000 on electrical modernization of the Magna mill, and is considering a similar program at the Arthur mill. Included in the program for Magna are a new primary substation, a primary distribution system and secondary substations and distribution systems.

WASHINGTON

★**Tungsten Mining & Milling Co.** started rehabilitation work in the middle of February at the Germania mine in Stevens County, about 80 mi. northwest of Spokane. Wendell Buoy, of Ione, a former superintendent for General Electric Co. which operated the property at one time, has contracted to do the work and was reported to have opened 800 ft. of tunnel late in February. According to Paul H. Casey, president and manager, installation of a 300-ton mill was to begin March 15, under a $50,000 RFC production loan. Ore from old

stopes, tailings, talus, and new ore will be processed. Several veins not worked by General Electric will be explored and in April a tunneling project across a ravine from the main adit will be developed. Fifty ft. of crosscutting and 250 ft. of drifting is planned. A $34,650 DMEA exploration loan was approved earlier, three-fourths of which is to be paid by the government. At the annual stockholders' meeting in Spokane in February, Paul H. Casey, C. F. Dean of Spokane, and Joe Dillion of Lewiston, were re-elected directors. Wellman A. Clark, R. Maurice Cooper and O. G. Whitman of Spokane, and Gerald Cook of Lewiston, Idaho, were elected as new directors.

★**Pioneer Mining Co.** is adding more than $10,000 in mining machinery this spring at its Longshot silver-lead-zinc mine in the Old Dominion district in Stevens County, according to President Darrel A. Newland. A diesel-powered air compressor for underground operations, ore cars and a mucking machine are to be installed. Open-pit mining was carried on in 1951, and approximately $9,000 in ore was shipped. The tunnel which was started down hill from the surface (to gain depth on the orebody) reached 118 ft. and according to Mr. Newland, 300 additional ft. of tunneling should reach the orebody. There exploratory work will be done by crosscutting, drifting, raising and diamond drilling.

★**Surface trenching** has been started on the six claims of S. G. Morin and Sons at their property near Deep Lake in Stevens County. They have contracted to produce a minimum of 30,000 tons of iron ore a year for the Three Peaks Mining Co. of Salt Lake City. A crew is at work cleaning out old tunnels. Mr. Morin reported that 30 assays taken by USBM, Bethlehem Steel Corp. and Geneva Steel showed an average iron content of 54½%.

★**Shipment of ore** from the beryllium property of Earl Cannon and son, 10 mi. north of Chewelah, is to start about April 15. F. G. and F. B. Cannon of Compton, Calif., will be associated with their brother in the project. The former will bring in equipment including air drills and compressors this spring. Work on a road to the property was scheduled to begin about April 1.

★**Kaiser Aluminum & Chemical Corp.** has planned a modernization and expansion program at its Tacoma plant which will increase output from 50-million lb. yearly to 66,400,000 lb., according to A. F. Garcia, plant manager. The work is expected to be completed this summer. Additional power on an interruptible basis will be supplied by Bonneville Power Administration.

★**Robbins Metal Co.**, one of the biggest aluminum fabricators in the Northwest, reported that the company was operating at less than 20% capa-

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Washington (*Continued*)

city in Spokane, because of the country's defense program. It was reported in February that aluminum fabricators were suspending operations because aluminum quotas were too low to operate at a profit.

★**In a recent report** to stockholders of Admiral Consolidated Mining Co., Everett Hougland, geologist, stated that an application for a government exploration loan was being prepared showing a detailed plan for a possible $25,000 exploration program which could be initiated in May and continue for 15 months. Drilling on the main tunnel level was planned for February and in March mining was to be started in the stopes. The mill was expected to be ready about March 15 for operation.

★**Something new** was introduced by Grandview Mines in February when Karl W. Jasper, president, took stockholders on a "tour" of Grandview mine and mill in Pend Oreille County and in parts of Stevens County where the company has more than 10,000 acres of mineral rights. It was done through colored slides. Diamond drilling on the 300-ft. level of the Grandview was shown, and **a self-loading mucking machine, developed by Dale I. Hayes,** western manager of American Zinc, Lead & Smelting Co., was shown in operation at a 24-ft. face in the mine.

★**Bear Basin Mining Co.** extended its "cat" road in 1951 from the mine-to-market road to within ½ mi. of its silver-lead-antimony Bear Basin mine on the west side of the Cascades in King County.

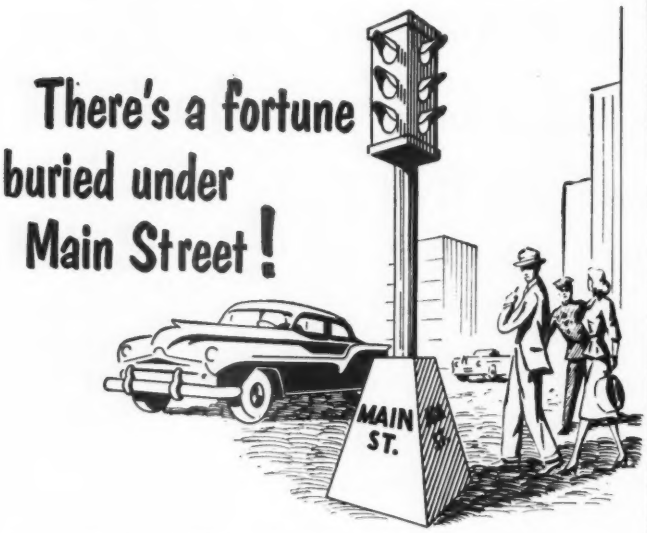
IN CANADA

BRITISH COLUMBIA

★**International Union of Mine, Mill & Smelter Workers** has lost a damage action against officers of the United Steelworkers of America (CIO-CCL) at Trail smelter of Consolidated Mining & Smelting Co., B. C. Supreme Court Justice J. O. Wilson rejected Mine-Mill claims of damages for breach of contract and "wrongful and malicious conspiracy to destroy Mine-Mill Local 480," and ordered Mine-Mill to pay costs of the action.

The court decision was the outcome of a legal action begun April 4, 1950, by Mine-Mill against R. C. Billingsley, president of USW Local 4281 at Trail, and USW officers Lloyd R. Bailey and Laurie Hamilton. Billingsley was president of Mine-Mill at Trail when he and the other two led a breakaway at Trail. Mine-Mill charged that the three men, besides conspiring to destroy their former union, had broken contracts they had with it as officers and also charged they had paid $7,000 in dues to the Mine-Mill International without authority. The Steelworkers officers said their action was in the interest—and for the protection of trade unionism, with the object of promoting the legitimate interests of CM&S employees and the public. They alleged Mine-Mill was not acting in the interests of national security and had been expelled from the CIO and CCL for that reason.

★ United States Steel Corp, has moved to cash in on projected expansion of the oil industry in B. C.—an expansion which will follow completion of an oil pipe line to the coast from Alberta and resultant refinery building at Vancouver. U. S. Steel has filed incorporation papers at Victoria, and will have its head office at Vancover. Also believed linked with the move is opening up of substantial iron ore deposits on the coast, although the oil business, sparked by the Trans Mountain pipe line is the primary goal at present. The incorporation involves Oil Well Supply Co., a former subsidiary, which became a division of the parent company under a new reorganization and expansion setup by U. S. Steel in one of its first moves into Canada. British America Oil Co. has announced plans for a $10-million refinery near Vancouver, while Imperial Oil will spend an estimated $12-million on a catalytic cracking plant



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near Vancouver. A similar expansion is indicated by Shell Oil Co. at Shellburn and Standard Oil of B. C. is acquiring additional property in the area.

★**Graham Bousquet Gold Mines Ltd.** of Ontario is carrying out a $25,000 diamond-drilling program to outline zinc deposits on Lynn Creek, Crown Mountain, near North Vancouver. Work is being done despite the protests of North Vancouver municipality and Greater Vancouver Water Board. Ore lies inside Vancouver's watershed area, but the proposed mill would be below the watershed. High-grade zinc showings are in a range of 1,500 ft. horizontally and 1,200 ft. vertically.

★**Sheep Creek Gold Mines Ltd.** plans to use its former 150-ton gold producing mill for its new base-metal property, the Mineral King. Sheep Creek is preparing it for production in the spring. In the first half of the fiscal year ended Nov. 30, 1951, the company's Zincton and Paradise properties produced ore of net smelter value of $719,130, giving an operating profit of $268,194.

★**Conwest Exploration Co. Ltd.** is financing development of the Salmo Prince Mines Ltd. property in the southern Kootenay zinc belt, about 10 mi. north of the Reeves MacDonald mine. Conwest, which has a large interest in the United Keno Hill mine and is also financing the McDame Creek asbestos property, where it has completed a surface survey, has started diamond drilling.

★**Guichon Mine Ltd.** has optioned the Buckeye group of silver-lead-zinc claims adjoining the Highland and Western Mines Ltd. properties in the Ainsworth mining division. The Highland mine, owned by Consolidated Mining & Smelting Co., is credited with $4-million production. Guichon also plans an exploration program on the Jessie group.

★**New Jersey Zinc Co.**, in the name of its subsidiary of New Jersey Explorations, Ltd., has purchased eight mining claims from Wesko Mines Co. The claims are in the zinc-lead field 18 mi. north of the International boundary, and they adjoin New Jersey's Oxide and Jackpot groups. They are in what is called the "lime belt," which some geologists predict will become America's greatest source of zinc.

★**A dog team "freight"** will be used to transport ore from newly formed Tungsten of British Columbia's tungsten-base metal property now being developed 40 mi. below Telegraph Creek on the Stikine River. Peter Hamlin, 70-year-old Lower Post prospector, who is preparing the property for engineer's examination, plans to take out several tons of ore by dog team before winter breaks.

★**Black Diamond Tungsten Ltd.** expects to start underground work in April at a wolframite deposit about

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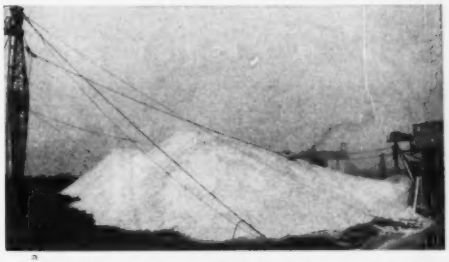

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British Columbia *(Continued)*

10 mi. from Atlin, and plans to install a mill. The operation is under management of Transcontinental Resources. A road to the property is currently being completed. Development program is estimated to cost $200,000.

★**Cariboo-Hudson** has given a contract to Gilpin-Bash Ltd. to complete the drift tunnel on the main tungsten vein opened this winter on the property near Barkerville. Initial bulk sampling across mining width showed average values of $120 per ton.

★**Shipments of iron ore to Japan** are due to increase this year to 130,000 or 140,000 tons a month. Argonaut Co. will be shipping 100,000 tons a month from deposits at Quinsam Lake on the east coast of Vancouver Island, and another 30,000 to 40,000 tons will come from Texada Island, where work is under way now, with mill and machinery to be installed soon.

★**Frobisher Ltd.** is planning to produce iron ore from its magnetite deposit on Zeballos River, Vancouver Island. Diamond drilling on the property will be resumed this spring and underground work will start by summer, according to the annual report. Previous drilling indicated a length of 340 ft. of ore contained 632,000 tons averaging 58.8% iron. Other drilling shows possibilities of reserves grading from 30 to 60%.

★A brand new town with initial population of from 500 to 1,000, predesigned with road, sewers and lighting facilities, is planned in remote northern B. C. by **Cassiar Asbestos Corp.**, Toronto, a subsidiary of Conwest Exploration Ltd., which is planning two mills at McDame Creek, 750 mi. from Vancouver and 65 mi. southwest of Lower Post on the Alaska Highway. Cassiar plans one mill, to handle 250 tons daily from higher grade and surface deposits, to be in operation in late 1952. Second unit, to be finished later, is planned to handle 400 to 600 tons daily of normal grade asbestos. Production will be trucked to the White Pass & Yukon Railway and shipped to coastal points for shipment by freighter to world markets.

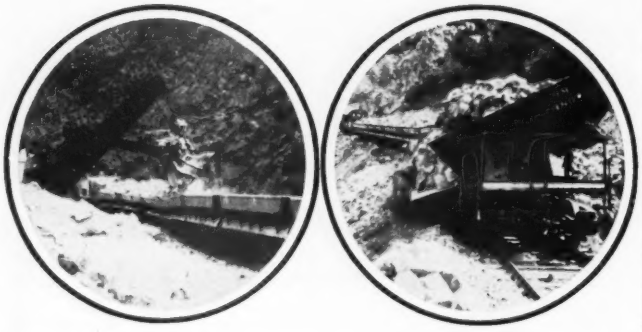
★First houses of a city eventually expected to have a population of 50,000 are due for erection this summer at Kitimat, site of **Aluminum Co. of Canada's** new aluminum refinery. Plans for the town, drawn by Mayer and Whittlesey, New York, already have been submitted to the B. C. Government for approval, and work will be started this spring by the contractors, Kitimat Constructors, on clearing and foundations for the smelter plants on new homes, chiefly for construction men. Between 1,500 and 2,000 men will be employed. Cost of the hydro-smelter project being set up in the Kitimat - Kemano - Tweedsmuir Park area of B. C. is running to more than the $160-million set aside for the first stage, according to McNeely DuBose, Alcan vice-president, and already $50-million has been spent. First aluminum production, at a rate of 80,000 tons annually, is scheduled for mid-1954. Increased costs are due mostly to changes in engineering for greater efficiency and safety.

MANITOBA

★**San Antonio Gold Mines Ltd.** reports excellent values in recent drilling on the 17th level, first of the block of 10 new levels to be opened. Development work on the adjoining Forty-Four ground is equally promising. It is considered that the property is approaching the production stage, although no decision has been made in this regard.

★**Sannorm Mines Ltd.**, whose property adjoins east of the San Antonio controlled Forty-Four Mines, has approved reorganization on an exchange basis of one new share for two old and the changing of the name to Consolidated Sannorm Mines Ltd. Attention is being directed to financing for possible resumption of operations. Prior to 1947 some 20,000 ft. of diamond drilling was completed on the 13-claim property.

Yes, you're seeing DOUBLE



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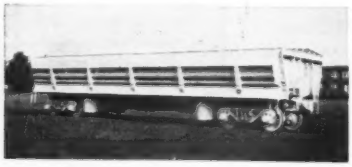

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★**Lee Gordon Mines** has intersected heavy mineralization in new drilling on the Vamp Lake property. The company is controlled by Canus Petroleum Corp.

★**James Richardson & Sons Ltd.** have acquired large holdings of mineral rights to land underlaid by extensive bentonite deposits in the Miami area of southern Manitoba. The company is planning early production of natural and activated clay from the Miami deposits.

ONTARIO

★**Kirkland Lake Gold Mining Co.** opened up 4,171 ft. of drift during 1951, averaging $20.20 across 3 ft. More than 3,000 ft. of the new ore was found on the 56th and 57th levels. Tonnage of ore reserves is now greater than at any time since World War II.

★**A new mine may be in the making** at Lake Shore Mines as a result of the discovery of a new ore system to the south on the 7,825-ft. level. More than 500 ft. of good grade ore has been opened up in drifting.

★**Silver Miller Mines** in the Cobalt camp has acquired controlling interest in the New LaRose Mining and Smelting Co. This gives Silver Miller control of 10 former silver mines, idle many years, and a vigorous exploration and development program will be started this year. Emphasis will be on cobalt. An 125-ton mill will be installed.

★**Hellens Mining and Reduction Co.'s** mill at Cobalt is now treating 300 tons daily. Plans call for doubling that tonnage this year. The company was formed in 1951 to mill the 1-million-ton tailings dump of the old Beaver and Temiskaming mines, with mill-feed estimated to average 4.5 oz. silver per ton.

★**Cobalt Lode Silver Mines** milled 28,-526 tons of ore in 1951 yielding 1,026,-972 oz. silver, and 117,043 lb. cobalt.

★**International Nickel Co. of Canada** mined 11.8-million tons of ore in 1951. Sales totaled $286.7-million in 1951; were $228-million in 1950.

★**Milnet Mines** has been formed to develop ore indicated by surface drilling last year by Jonsmith Gold Mines in Parkin Twp., Sudbury area. Two orebodies were outlined, the larger one containing 179,200 tons averaging 2.15% copper, 1.23% nickel, and 0.114 oz. platinum per ton. A mining plant has been installed, and a three-compartment shaft will be sunk to 400 ft. this year.

★**East Rim Nickel Mines**, developing the first two levels at its property 15 mi. northeast of Sudbury, estimates probable and indicated ore at 1-million tons with combined nickel-copper grade just under 2%. The shaft has been deepened to open a third level at 550 ft.

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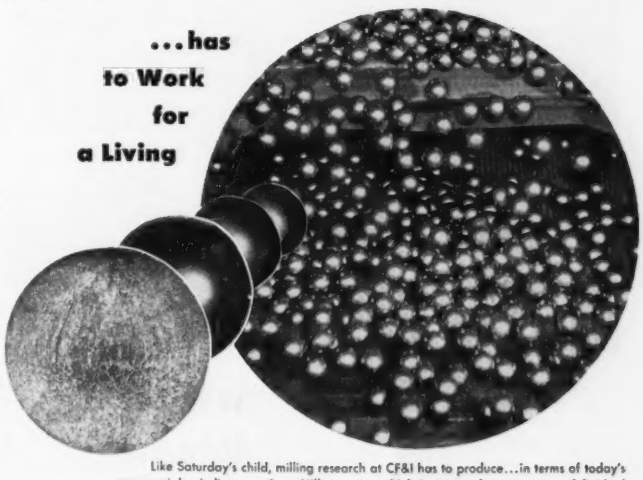

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★**Fab Metal Mines**, also in Parkin Twp., has encountered encouraging indications of copper-zinc-silver mineralization in first surface drilling along a 2,100 ft. long zone.

★**Algoma Ore Properties Ltd.** mined more than 1.8-million tons of siderite at its Helen Mine in Michipicoten in 1951. This was reduced by sintering to 1.2-million tons of premium-grade iron ore. Output is being maintained at 5,000 tons daily.

★Start of production at **Ontario's first lead-zinc mine** to operate in many years may be expected this spring. Matarrow mine in Matachewan will mill the ore in its own plant. The Matarrow mine is financed and managed by Matachewan Consolidated Mines.

QUEBEC

★Work has started on a three-compartment shaft to be sunk to 600 ft. initially on the **Chibougamau Explorers** property. A substantial gold-copper orebody has been indicated here by drilling.

★**Campbell Chibougamau Mines** shaft-sinking is nearing the 250-ft. horizon.

Quebec (*Continued*)

Ultimate depth will be 1,000 ft. for the establishment of seven mining levels. Tentative plans are being made for production, with a 2,000-ton mill considered a possibility.

★**Asbestos Corp.,** producing from four mines, milled 3.7-million tons in 1951, as compared with 3.3-million tons in 1950. Ore reserves climbed to 96 million tons. A fifth mine, the Normandie, is being started this year. It will have a milling capacity of 5,000 tons, and will start production sometime in 1954.

★**Brevcourt Gold Mines** is scheduled to start its 500-ton mill late in April. Mine development thus far reveals ore reserves of about 1.5-million tons above the 1,000 ft. level averaging about 0.25 oz. gold. Perron Gold Mines and Little Long Lac Gold Mines hold substantial interests in Brevcourt.

★**Weedon Pyrite and Copper Corp.,** 39 mi. from Sherbrooke, estimates new indicated ore at about 100,000 tons as a result of work to date. Grade is above mine average. The original estimate was 200,000 tons averaging 30 to 35% sulphur, and 2% copper; this being the remnant of known ore left when the workings were closed down many years ago.

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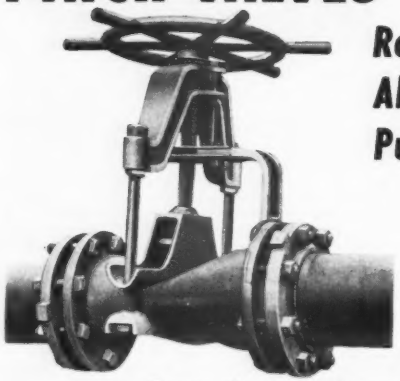

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★**Lachance Mines,** a new company, plans diamond drilling at its pyrite-lead prospect east of Megantic. A mineralized zone has been traced for 1,000 ft. by trenching on this property.

YUKON

★**Yukon Consolidated Gold Corp.** and Dawson Miners Union No. 564 International Union of Mine, Mill & Smelter Workers negotiated an agreement which will give the workers, ranging from 80 men to 400 at peak, 10% an hour increase retroactive from Nov. 1, 1951. Basic wage rate is now $1.15 per hour. Yukon's manager, C. E. McLeod, hopes for a record production in 1952.

★**Atlin-Ruffner Mines** did exploration and development work and rehabilitated its mine near Atlin to the extent of $200,000 last season. Operations have been suspended, waiting for more favorable conditions.

IN AFRICA

★**West Driefontein,** which came into production in February, may turn out to be the richest yet of all Witwatersrand properties. Drilling proved existence of three reef formations considered to extend from a depth of 2,350 ft. at the eastern end of the property to 8,500 ft. at the western end. Good values were obtained in drilling, the best being 4,338 in-dwt., but subsequent development has yielded figures higher than the average obtained in the boreholes.

★**The South African Minister of Mines,** J. H. Viljoen, has announced new agreements for the production of uranium by the Rand gold mines. Six gold mines have already undertaken to extract uranium, and other gold mines are being invited. Plants will be financed by loans from British and American sources. The uranium will be paid for on a cost-plus basis. First output is expected in the second half of this year; most of the producers now installing plants should be producing by 1953; and peak production should be reached in four or five years. A plant is also being built which will prepare the concentrates in a form for convenient shipment. Capital for this plant will come from British and American sources.

★**Mineral production in Southern Rhodesia** during 1951 was in part as follows: asbestos, 77,663 tons valued at about $25-million; chrome ore (exported), 330,989 tons, valued at $4.2-million; gold, 487,000 oz., valued at $17-million. Total revenue from mineral production was about $42-million.

★**Bethlehem Steel Corp. of South Africa** has been given exclusive prospecting rights over an area exceeding 30,000 sq. mi. for iron and manganese

ores in South West Africa. The six concession areas are in northwest Kaokoveld, the Otjiwarango district, the Windhoek district, the Keetsmanshoop district, the Bethane district, and the Swakopmund district. It is expected that geological parties will be at work here soon.

IN AUSTRALIA

★Reports from the well-guarded **Rum Jungle uranium field** indicate that the deposits are of exceptional purity and richness, and experts think they are among the biggest in the Western World. Further exploration is proceeding. A speed-up of development in this and other Australian uranium fields has been ordered. Australia looks confidently to an increase in dollar inflow from uranium sales.

A news item in the United States reported early in March that Jesse Johnson, director of the Raw Materials Division, U. S. Atomic Energy Commission, and two other experts from the U. S. had toured the jungle uranium fields 70 mi. south of Darwin and other uranium fields. Some of the finds were described as "very promising."

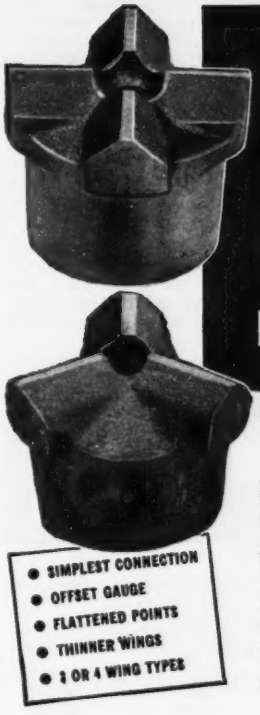
★Drilling operations on what is expected to be **a huge bauxite deposit** will start soon on Marchinbar Island, 400 mi. east of Darwin. Another large bauxite deposit was discovered in Gippsland. Reserves of Gippsland high-grade bauxite were estimated to be at least 1-million tons.

★**Australian production** of refined gold was 69,500 oz. for December, bringing the total for 1951 to 882,300 oz. In the first three months of "premium gold" selling, about 80% of the total output has been delivered to the Gold Producers Association at Kalgoorlie, which is handling sales on "free" markets. Gold is being sold at about 10% above the fixed $35 per oz.

★**Montana Silver Lead N.L.** will develop its mine on a larger scale. A selective flotation plant will be operating in the second half of 1952 to treat ore containing about 10% lead, 10 to 12 oz. silver, and 1.7% zinc. In the meantime gravity production will continue, and tailings will be retreated later. The Montana ore is being broken 14 ft. wide with no footwall showing up yet. The orebody on the 150 ft. level has been opened up for 180 ft. with good ore still in the face.

★**Austral-Malay Tin Ltd.** has taken an option on the Murphy mine at Moina, and a separate company may be formed to operate this mine for tin and tungsten.

★**Norseman Gold Mines N.L.** has delayed gold development plans in order to concentrate on pyrite production to relieve the sulphur shortage. Probable and proved pyrites reserves are now nearly 3-million tons. The company needs £300,000 to carry out the pyrites expansion program, and a retroactive increase in the price of sulphur would help it get at least one-half that amount.



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IN EUROPE

★**Austrian production** of all grades of magnesite, except caustic calcined magnesite, increased during 1951. Crude magnesite output rose from 544,753 tons in 1950 to 664,188 tons in 1951; sintered magnesite from 168,623 to 195,056 tons; and magnesite bricks from 112,177 to 131,388 tons. Caustic calcined magnesite production declined from 89,351 to 87,420 tons for 1951. Magnesite is one of Austria's major mineral products, and in the past production here has exceeded that of the U. S. in some grades, particularly crude.

★**The big aluminum plant** at Ranshofen, Upper Austria (U. S. Zone) has increased its output from 12,000 metric tons in 1950 to 20,000 metric tons in 1951. More power was available in 1951. About half of this output is sold to Austrian manufacturers of metal goods.

★**Cyprus mineral exports** last year reached a record value of £7-million, an increase of about £1½-million over

Europe (*Continued*)

the 1950 level. Cupreous pyrite concentrates, pyrites, iron pyrites, and cement copper totaling 821,000 tons were exported last year, chiefly to Western Europe, U. S., and Egypt. More than 18,000 tons of asbestos fiber were produced with exports mainly going to Denmark, U. K., Ireland, Israel and Sweden, bringing in about £750,000. The 13,000 tons of chrome ore exported last year went mainly to France and Germany.

★**Denmark's plant in Jutland** for making manganese sulphate from bog ore is expected to start during the last quarter of this year. Annual capacity will be about 1,000 tons of manganese sulphate, or about double Denmark's total consumption. Previously Denmark had exported bog iron ore with manganese to the Ruhr. But the authorities have now banned the shipment of ore containing more than 10% manganese to conserve supplies for the domestic industry. Shipments of bog ore totaled about 30,000 tons in 1951.

★**Vereinigten Aluminimwerke AG** will soon start up an aluminum electrolytic plant at Luene which has been idle since World War II. The company at present is producing 1,700 to 1,900 tons monthly at two other electrolytic plants. The third one will increase output by about 600 to 900 tons monthly. Bauxite supplies come from Yugoslavia, Greece and France.

★**Spain has set aside** a national mining reservation, called Carbonell, for radioactive minerals in the Province of Cordoba.

★**Promising new asbestos deposits are** now being exploited in Serrania de Ronda, Spain. The new deposits contain minerals with fibers up to 2 cm. (.79 in.) long. Output is now about 30 metric tons of clean asbestos per month. Plans call for increasing this by 100 to 200% shortly. Spanish asbestos demand is 5,000 to 6,000 metric tons per year, much of which comes from Canada.

★**The Swedish iron and steel industry** plans to increase the production of ingot steel from the 1951 rate of 1.5-million tons to over 2-million tons annually by 1955. Sweden has an estimated 30 to 50-million tons of high-grade low-phosphorus iron ore reserves, and about 2.2-billion tons of high-phosphorus iron ore reserves. Because of the difficulty of importing coal and coke, the Swedish steel industry has been using oil and electricity on an increasing scale. Favorable results with sponge iron as a basic raw material have led several steel companies to make plans for sponge-iron works.

Canadian MINING ON THE MARCH

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IN LATIN AMERICA

CHILE

★**CORFO (Chilean R.F.C.)** will spend $63,500 (U. S.) on mine exploration and development, chiefly in the provinces of Atacama, Coquimbo, and Santiago.

★**Because of the world sulphur shortage** much interest is centered on Chilean sulphur deposits which are of the volcanic or surface type. Chile has produced as much as 35,000 metric tons of brimstone in 1940, but averaged about 22,000 yearly over the last 11 years. Present price of brimstone at Chilean ports is about $140 per ton 99.5% grade.

The autoclave refining plants at the sulphur deposits of Ollague and Aucanquilcha are again producing at full capacity. Other deposits are being exploited at Aguas Blancas, many in the San Pedro de Atacama district, Codocedo, Poplan, Pampa Lirima and others.

★**Paulino Callejas and Sons** are building a new copper flotation mill at the old copper camp of El Morado in the Atacama province. The 110-ton mill will cost $300,000.

★Chile will sell Pakistan 14,000 tons of copper.

★In the future **all copper sold by the**

Chilean Government from the 20% quota it receives from American-owned properties in Chile will be made through the Central Bank.

★**The Paipote smelter** was inaugurated by President of Chile, Gonzalez Videla, on Jan. 26. The smelter cost 350-million pesos; machinery imported from the U. S. cost $4.25-million. Allis-Chalmers was responsible for the design and supplied most of the machinery. Allis-Chalmers officials who were present at this inauguration were: J. L. Singleton, vice president; G. V. Woody, manager of the Basic Industries Division; Paul Dietz, export manager; and Erlin Wisnes, general manager for South America.

★**Chile has sold electrolytic copper** worth $7,118,000 to Sweden, Holland, Belgium, Western Germany, and Switzerland.

★A cargo of **6,000 tons of sulphur** was scheduled for March shipment from Antofagasta to Finland.

★According to Jess Larson, DMPA chief, the U. S. will soon send several geologists to investigate copper, sulphur, and other strategic mineral deposits in Chile.

COLOMBIA

★Exploitation of only high-grade gold deposits along river beds is responsible for the **gold output increase in 1951.** Total output in 1951 was 13,395,485 g. valued at $11,758,800 as compared with 1950 output of 11,799,713 g. valued at $10,358,000. January 1952 gold production was 1,418,022 g. as compared with a monthly average of 1,116,290 g. for 1951. Silver output increased from 3,610,834 g. in 1950 to 4,043,870 g. in 1951, and output during January 1952 was 386,335 g.

★**Compania Colombiana de Metales y Minas** signed a contract with Ministerio de Fomento for the mining of zinc deposits on 1,794 hectares near Mercaderes and Bolivar in the Cauca Department.

MEXICO

★**Bank of Mexico and a German syndicate** have reached an agreement for the establishment of an iron and steel works near Durango City in exchange for 40 million pesos' ($4,620,000) worth of Mexican cotton. Ore for the plant will come from the Cerro del Mercado deposit near Durango City.

★**Five-million ounces** of silver were recently shipped to West Germany. A like consignment was shipped last December. The silver will be used for minting. Dominican Republic, the Philippines, and Pakistan are continuing negotiations with the bank for the purchase (reportedly) of 10-million oz. each.

★**Mining costs have been increased as**

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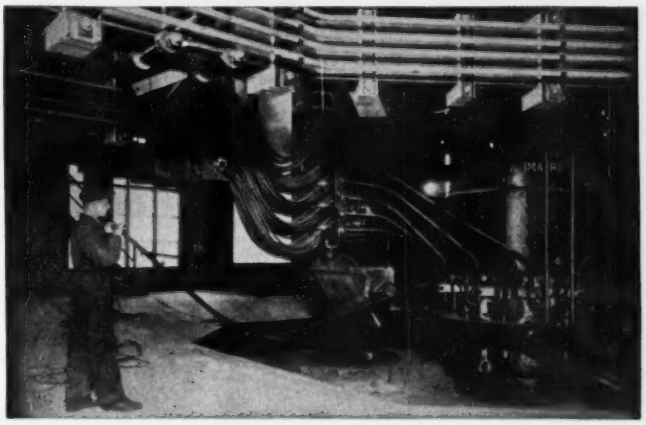

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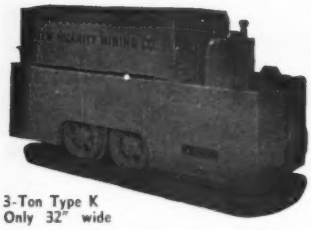

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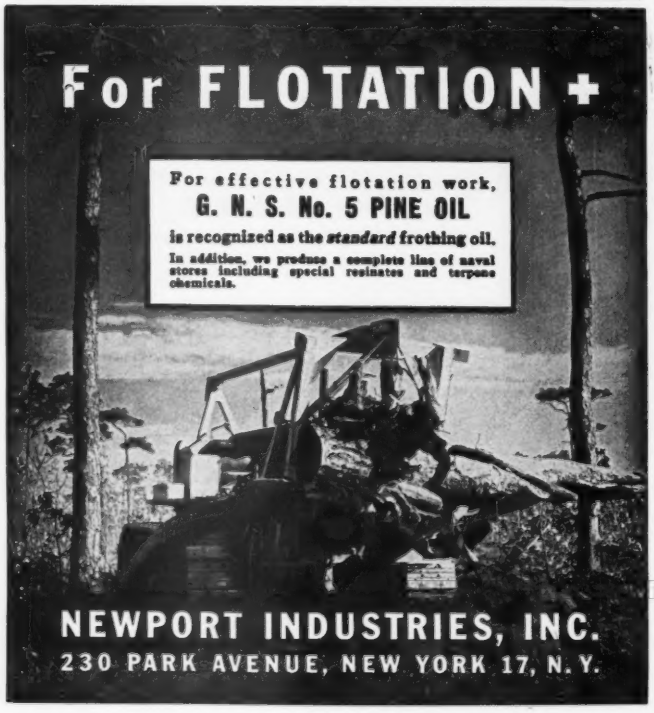
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Mexico (*Continued*)

a result of the 16.66% freight rate boost by the government-administered National Railways, and the 20% increase by Southern Pacific Railway of Mexico which the government has started to buy.

★**Development of the nickel-cobalt deposit** near Culiacan is under way. Cia. Estano Mexicano of Mexico City owns the deposit.

★**A fluorite deposit** near Rosita, close to the American border, is attracting the interest of several American companies. Prospectors discovered the deposit several years ago.

★**Silver production** during 1951 in Mexico was 44,249,127 oz.

IN THE PHILIPPINES

★**Gold output in January** from the seven producing gold mines totalled 32,000 oz. valued at $1,121,400 at the statutory price. During the month the gold price on the Manila open market averaged about 117 pesos per oz. which afforded substantial higher receipts to the gold producers. Thus the January output for Itogon, valued at $114,200 at 70 pesos per oz. actually brought $171,180 or about 50% more than the statutory price.

Benguet-Balatoc milled 75,500 tons in January and recovered $582,700, slightly less than in December, from ore averaging 0.27 oz. per ton. Mindanao Motherlode, Surigao Consolidated, and Itogon showed small increases. Atok-Big Wedge production slipped to $85,000 recovered during the month from milling 14,400 tons averaging about $6 per ton. The steady decline in value of the millheads since January 1951 has been causing concern. Lepanto easily maintained its position as the largest producer in the Philippine mining industry by shipping copper-gold concentrates valued at over $991,000 during the month. It is reported that the company has contracted to sell 66% of its current copper output to European buyers at 40¢ per lb. Baguio Gold Mining Company, an important prewar producer in Mountain Province, resumed operations at its new mill.

★**Copper production** in the Philippines increased to 12,700 metric tons in 1951, up about 22% over 1950. Value of the copper exported increased over 80% because of higher world prices paid than in 1950. Exports of iron ore to Japan exceeded 900,000 long tons and were 50% larger than in the previous year. Production of manganese ore was less than in 1950, declining to 22,340 metric tons from 29,860 tons in 1950. On the other hand chromite shipments increased 33% and appear sure to establish another all-time record in 1952.

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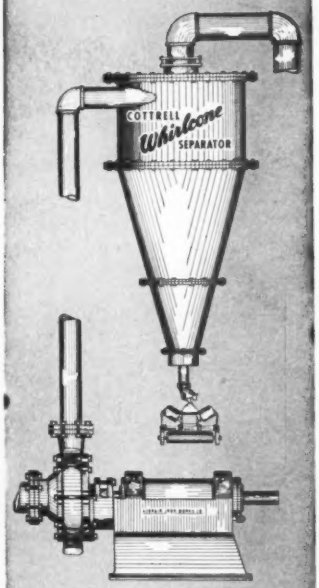

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NEW BOOKS

The Formation of Mineral Deposits. By Alan M. Bateman. One of the finest recent books written in language as nontechnical as possible to present fundamental information on the origin of mineral deposits. Much of the material presented comes from the author's "Economic Mineral Deposits" — a more expanded and technical treatment of the subject. This book will go far to inform readers who desire more information on the geology of mineral deposits, but who lack the technical training to fathom the more advanced and ultratechnical terminology used in geology books. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N.Y. Pp. 371, Price $5.50.

Mineralogy. New Fourth Edition by Kraus, Hunt and Ramsdell. Changes in this well-known text are: expansion of material on optical mineralogy, crystal structure and X-ray analysis, gems and precious stones; a new selected bibliography; improved illustrations, now totaling 745; modernization of determinative tables. The first book on mineralogy in English to make extensive use of half-tone cuts of crystal models. Published by McGraw-Hill Book Co., 330 West 42nd St., New York 18, N. Y. Pp. 664. Price $7.50.

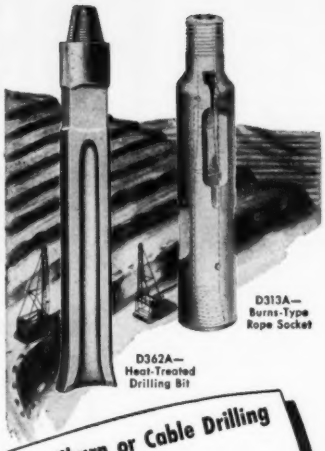
Black Market Yearbook. The only index of world black market prices for gold and currency ever published. This 1951 yearbook will include a compilation of essential statistics never before obtainable in complete organized, usable form. You might call it a straightforward index of depreciation of currencies. Published by Pick's World Currency Report, 75 West St., New York 6, N.Y. Pp 164. Price $25.

Alternating-Current Machines. By George V. Mueller, Professor of Electrical Engineering, Purdue University. Published by McGraw-Hill Book Co., 330 West 42d St., New York 18, N. Y. Pp. 502. Price $7.50.

A text intended primarily for use by senior electrical engineering students. Subjects covered include analysis of the construction and operating principles of transformers, polyphase induction machines, synchronous machines, single-phase motors, and rectifiers. An unusual number of problems and oscillograms are included.

Tax-Sheltered Investments. By W. J. Casey and J. K. Lasser. You'll be glad to know that the 1951 tax law and the DMEA's mineral exploration program have combined to make mining an attractive investment. Or at least, more attractive than before.

That's the conclusion reached in the chapter on mining in Casey and Lasser's book on tax-sheltered invest-



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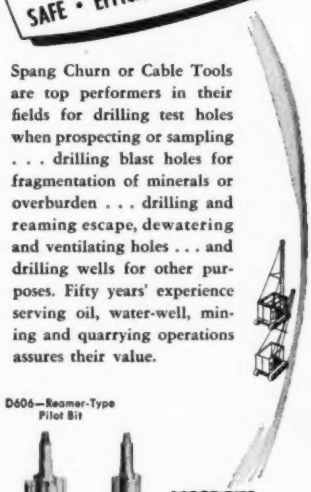

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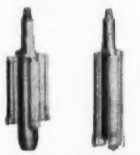

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ments. Their purpose was simply to evaluate the merits of about 20 industries and other investment possibilities from the point of view of the protection they give against the inroads of the current tax laws.

Casey and Lasser know the tax structure of the federal government as well as it can be known; their reputation is nation-wide. Their analysis of mining does exhibit an understandable lack of knowledge of the details of mining, but they do have the tax angle down pretty well. However, this reviewer has the feeling that they attach undue importance to the two factors mentioned above. In other words, metal mining was a good investment, approached wisely, before DMEA and the 1951 tax law, and it still is. There is now some increased tax benefit, but it doesn't make all that difference.

Let's just say that if you have several thousand dollars to invest, you'll find a lot of food for thought in this book. Published by Business Reports Inc., 225 West 34th St., New York 1, N. Y. Price $12.50.

Greenbushes Mineral Field. A comprehensive report on the geology and mineral resources of Greenbushes Mineral Field in Western Australia with numerous detail maps by R. A. Hobson and R. S. Matheson. Published by the Geological Survey of Western Australia, Perth, W. A. Pp. 219.

Some Economic Aspects of the Principal Tantalum-Bearing Deposits of the Pilbara Goldfield, Northwest Division. A thorough report on the occurrence of tantalum and other pegmatite minerals by H. A. Ellis, Geological Survey of Western Australia. Pp. 93 plus numerous maps. Published by the Geological Survey of Western Australia, Perth, W. A.

Soil Testing for Engineers. By T. William Lambe, Massachusetts Institute of Technology. A text covering tests for specific gravity, grain size, compaction, permeability, strength and other properties of soil. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. Pp. 165, price $5.

Tin Deposits of Durango, Mexico. Geological Survey Bulletin 962-D by Ward Smith, Kenneth Segerstrom, and Reinaldo Guiza, Jr. The authors concluded that tin production from this area, which is estimated to have exceeded 150 to 300 tons per year for many years, will slowly decline with gradual exhaustion of placer deposits from which major production comes. For sale by Superintendent of Documents, U.S. Government Printing Office, Washington 25, D.C. Pp. 60.

Geology of Bitterwater Creek Area, Kern County, California. Special Report No. 6. Published by the California Division of Mines, Ferry Building, San Francisco, Calif. Pp. 21 plus maps.

(*Continued on page 162*)

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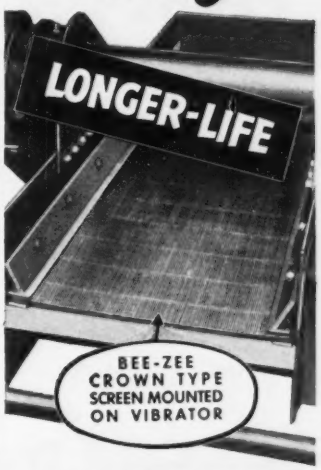

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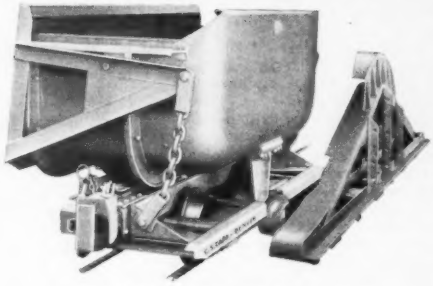

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Books *(Continued)*

Techniques of Plant Maintenance, 1951. Proceedings of the 1951 Conference on Plant Maintenance which included sessions on electrical equipment, power plant and heating equipment, small plants, lighting equipment, chemical plants, metal-working plants, and applied lubrication. For sale by Clapp & Poliak, Inc., 341 Madison Ave., New York 17, N.Y. Pp. 223. Price $6.

Antimony Occurrences of Washington. By C. Phillips Purdy, Jr. Published by Washington Division of Mines and Geology, Olympia, Washington. Pp. 186. Price $1.

The following Geological Survey Bulletins are for sale by the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C.:

955-F. Quicksilver Deposits of the Bonanza-Nonpareil District, Douglas County, Oregon.

969-E. Quicksilver Deposits of the Horse Heaven Mining District, Oregon.

969-C. A Geologic Reconnaissance of Parts of Beaverhead and Madison Counties, Montana.

973-A. Magnetic Exploration for Chromite.

977. Bibliography of North American Geology 1949.

978-A. Magnesium-Mineral Resources of the Current Creek District, Nevada.

The following reports may be obtained from the Publications Distribution Section, Bureau of Mines, 4800 Forbes St., Pittsburgh, Pa.:

R.I. 4837. Removal of Magnesium and Magnesium Chloride from Titanium Sponge by Vacuum Distillation.

R.I. 4853. Diamond Orientation in Diamond Bits. A Method of Identifying Hard Vectors for Setting Purposes.

R.I. 4843 Process for Recovering Gold and Silver from Activated Carbon by Leaching and Electrolysis.

I.C. 7602. Mines and Mineral Deposits (Except Fuels) Judith Basin County, Montana.

R.I. 4800. Diamond Orientation in Diamond Bits. Procedures and Preliminary Results.

I.C. 7607. Mines and Mineral Deposits (Except Fuels) Gallatin County, Montana.

I.C. 7603. Ventilating Methods and Safety Measures Used in the Temporary Ventilation of the King Solomon Tunnel, Frisco, Summit County, Colo.

I.C. 7592. Mines and Mineral Deposits (Except Fuels) Broadwater County, Mont.

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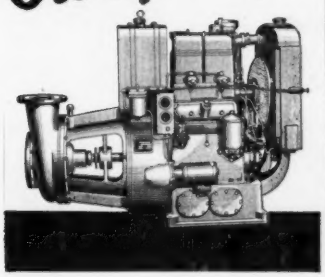

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Books (*Continued*)

Energy Sources—The Wealth of the World. By Eugene Ayres, Gulf Research and Development Co., and Charles A. Scarlott, Editor, Westinghouse Engineer. Published by McGraw-Hill Book Co., 330 West 42d St., New York 18, N. Y. Pp. 344. Price $5

An excellent appraisal of the sources of energy from all important types of fuel. One startling revelation is the relatively low percentage of future reserves estimated for oil and gas in comparison with those for coal. Ultimate reserves of energy from all fossil-fuel deposits of the world in horsepower-hours x 10^{11} are listed as follows: Maximum—coal, 750; petroleum (liquid), 5; natural gas, 3; oil shale, 12; tar, 20; peat, 5. Minimum—coal, 75; petroleum (liquid), 3; natural gas, 2; oil shale, 2; peat, 5. Other sources of energy including wind, tide, and waterpower are also evaluated.

The position of nuclear power is summarized in part as follows: "One can hardly escape the conclusion that, even when engineering problems are solved—power for uranium-fueled plants will not be cheap power. It is almost idle to speculate at this juncture. The problems are not likely to be solved quickly enough to permit a commercial nuclear-power plant to go into operation before 1960, perhaps 1970."

Modern Pyrometry. Chapters in this useful book discuss: types and uses of thermocouples, lead wires, and protection tubes; temperature indicators, recorders, and controllers; other methods of temperature measurement and control; applications, care, and maintenance of pyrometers. The appendix contains nine pages of useful tables. Published by The Chemical Publishing Co., Inc., 26 Court St., Brooklyn 2, N. Y. Pp. 150. Price $4.

Market Outlook for Sulphur Recoverable from Coal. A paper by Walter H. Voskuil, Mineral Economist, Illinois State Geological Survey, presented at a meeting of the Illinois Mining Institute, Nov 2, 1951. A good overall study of the sulphur market problem, and a detailed discussion of sulphur present in coals. The possibilities of economic recovery of sulphur from coal are weighed carefully, and the author concludes that possible producers from this source will have to evaluate the competitive position of "sulphur from stack gases, oil refinery gases, and imported pyrites." Published by the Illinois State Geological Survey, Urbana, Ill. Pp. 32.

Magnetic Base Stations in Lake Superior Iron Districts. By Gordon Bath. Includes much valuable basic information on the calibration theory of Akania and Hotchkiss superdip magnetometers which will be useful to engineers conducting magnetic surveys. Pp. 16 plus numerous maps and tables.

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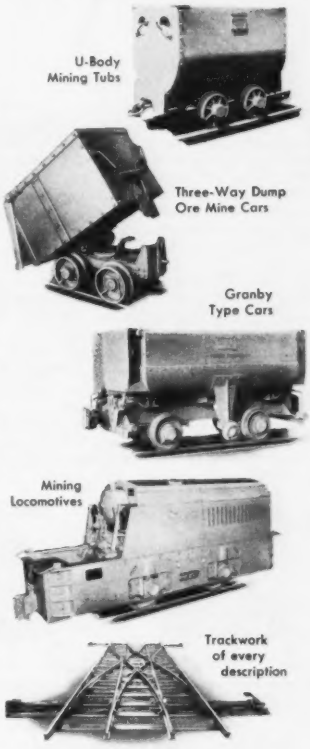

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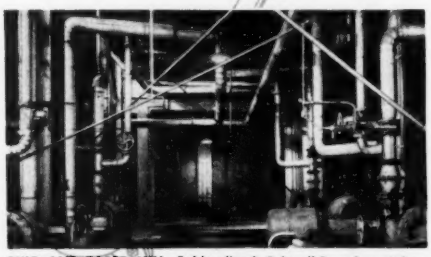
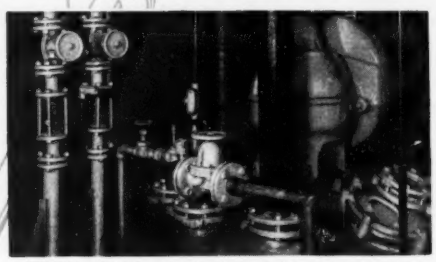
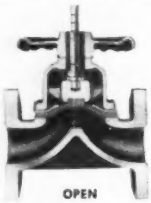


PULP AND PAPER MILL. Rubber-lined Grinnell-Saunders Valves on stainless steel piping handle sulphate pulp stock in bleach plant of Potlatch Forests, Inc., Lewiston, Idaho.

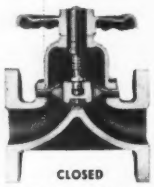


CHEMICAL PLANTS. Glass-lined Grinnell-Saunders Diaphragm Valves, with KEL-F diaphragms, handle chlorinated organic chemicals at Hooker Electrochemical Company, Niagara Falls, N. Y.



OPEN

Showing rising spindle . . . valves are available with rising or stationary spindle.

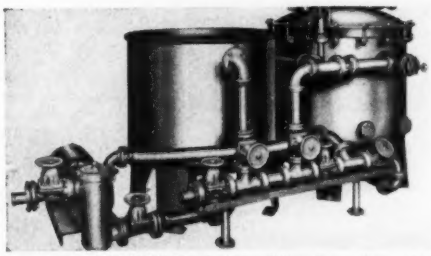


CLOSED

KEL-F diaphragm, using special rubber backing cushion and floating tube nut design.

CHECK THESE GRINNELL-SAUNDERS FEATURES...

- Diaphragm absolutely isolates working parts from the fluid.
- Diaphragm lifts high for streamline flow in either direction.
- Diaphragm presses tight for positive closure.
- Body, lining and diaphragm materials to suit service.
- Simple maintenance — diaphragm easily replaced.



EQUIPMENT MANUFACTURERS. Grinnell-Saunders valves with rubber linings are standard on filtration equipment for solution clarification, made by Industrial Filter & Pump Mfg. Co., Chicago, Ill.

GRINNELL

WHENEVER PIPING IS INVOLVED

Grinnell Company Inc., Providence, Rhode Island • Sales Offices and Warehouses in Principal Cities

pipe and tube fittings • welding fittings • engineered pipe hangers and supports • Thermolier unit heaters • valves
Grinnell-Saunders diaphragm valves • pipe • prefabricated piping • plumbing and heating specialties • water works supplies
industrial supplies • Grinnell automatic sprinkler fire protection systems • Amco air conditioning systems

DOW
(BEAR BRAND)
Xanthates
bring . . . Maximum Recovery

DOW XANTHATES
available

- Z-3—Potassium Ethyl Xanthate
- Z-4—Sodium Ethyl Xanthate
- Z-5—Potassium Amyl Xanthate*
- Z-6—Potassium Pentasol Amyl Xanthate*
- Z-8—Potassium Secondary Butyl Xanthate
- Z-9—Potassium Isopropyl Xanthate
- Z-11—Sodium Isopropyl Xanthate

*From Sharples Amyl Alcohols

Wherever flotation of sulphide metals is practiced, Dow Xanthates are the predominant choice as collector reagents. They offer all the essential qualities for rapid, effective recovery of the values. Their uniformity and stability are of outstanding importance.

"Over Twenty-five Years Experience in Producing Xanthates for Metallurgical Use"

THE DOW CHEMICAL COMPANY
San Francisco 4, California, U. S. A.

DOW
CHEMICALS
INDISPENSABLE TO INDUSTRY AND AGRICULTURE

Men get less tired!
Safety records improve!
Tonnages rise!

TAKE the hardest part of the work out of drilling and speed it up, too. Equip your miners with Le Roi-CLEVELAND HC10 Air-feed Sinker Drills — then watch tonnages per man-shift go up.

A lightweight column — pneumatic- or screw-type — supports the HC10. Setting-up takes only a few minutes. Feeding is done by air-pressure. All controls are handy.

Quick reverse feed makes it quick and easy to change steels. There are no swing or dump nuts to loosen or tighten.

The fast, light blows of Le Roi-CLEVELAND Air-Feed Sinker Drills are just right for carbide bits. You get maximum bit life — can use smaller bits for higher drilling speeds.

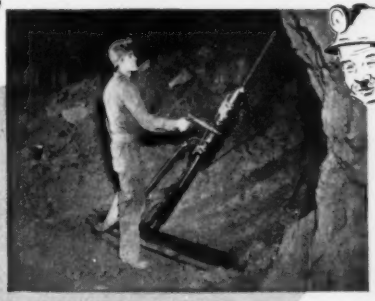
In addition to the popular HC10 model with 45-lb. drill, Le Roi-CLEVELAND Air-feed Sinker Drills are available in an HC23 model with 3 1/8" bore. Both models help your miners produce more footage and greater tonnages. And because the men don't get so tired, safety records improve.

Write today for complete information.

LE ROI COMPANY RD-44
CLEVELAND ROCK DRILL DIVISION
12500 Berea Road, Cleveland 11, Ohio
Plants: Milwaukee, Cleveland and Greenwich, Ohio

3 way gear-up...

with the GARDNER-DENVER RB STOPER

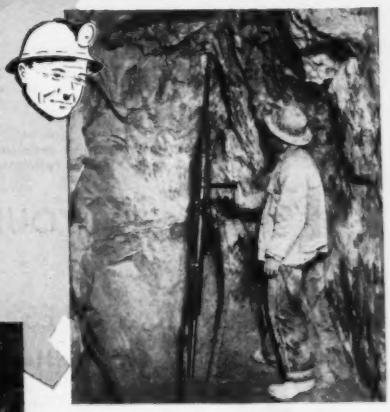


puts your drill runners in high gear

Lets them drill more footage—produce more ore—thanks to perfect balance, easy holding characteristics, fast penetration, and automatic cleaning that eliminates clogged air screens.

meshes with your foremen's safety program

Helps them eliminate dry drilling. The desirable water-on—air-on—air-off—water-off cycle is automatically assured by the single throttle control valve.



won't clash with your drill doctor's schedule

The RB stays down in the stope between routine inspections—thanks to tough construction and the automatic air flow that constantly keeps sludge and cuttings out of the chuck end.

For greater safety—increased production and lower costs—select the RB Stoper for your mine—either the heavy-duty RB104 or the lightweight RB94. Write today for full details.

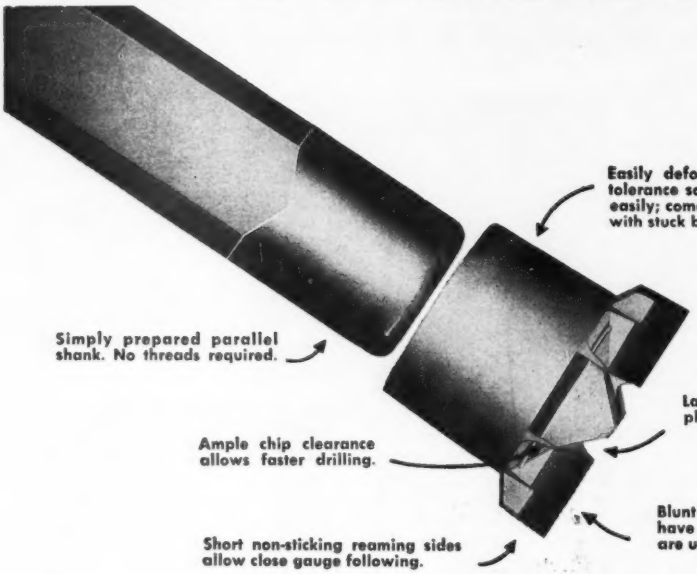
SINCE 1859

GARDNER-DENVER

Gardner-Denver Company, Quincy, Illinois
In Canada: Gardner-Denver Company (Canada), Ltd., Toronto, Ontario

THE QUALITY LEADER IN COMPRESSORS, PUMPS AND ROCK DRILLS

THROWAWAY


Easily deformable skirt with close tolerance socket hole . . . bit goes on easily; comes off easily; no lost time with stuck bits.
Simply prepared parallel shank. No threads required.
Large hemispherical non-plugging water outlet.
Ample chip clearance allows faster drilling.
Blunt non-breaking cutting edges have self-sharpening tendency — are uniformly hard.
Short non-sticking reaming sides allow close gauge following.

LOWER YOUR DRILLING COSTS
with
SMALLER HOLES AND FASTER DRILLING

Bottom with 1¼" Hole

Save Powder and Steel

DISTRIBUTORS

Bonne Terre Farming & Cattle Co.
Bonne Terre, Missouri

Creative Engineering
825 1st National Bank Bldg.,
Denver, Colo.

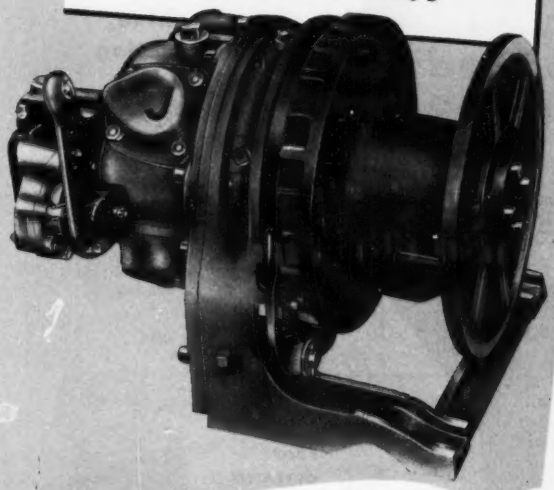
THE "TEST" WILL PROVE ITS WORTH

THROWAWAY BIT CORPORATION

4200 N.W. Yeon Ave. Portland, Oregon, U.S.A.

Fully descriptive literature on all products is available. Competent field engineers and dealers are always at your service.

Some territories still open for distributors and jobbers.



IT'S SAFER . . .

When hand is released from throttle, automatic safety brake stops and holds load stationary.

IT'S SIMPLER . . .

All control is by a single lever which can easily be arranged for remote control.

IT'S POWERFUL . . .

1200 lbs. capacity with drum ½ full of rope—2400 lbs. at first turn of rope on drum.

IT'S REVERSIBLE . . .

Simple movement of the lever hoists or lowers the load, as desired.

. . . IT'S THE NEW

JOY DW-111

"PISTONAIR" HOIST

The new JOY DW-111 "Pistonair" is a powerful, versatile single drum hoist powered by a 4 cylinder, 4 H.P. compressed air motor.

The automatic safety brake is actuated by simply returning the throttle lever to the "off" position. An additional safety factor is the spring return of the throttle lever. If the operator's hand were to slip off the throttle, the lever would instantly spring to "off", actuate the safety brake, and stop and hold the load in any position.

Power plant and gearing mechanism of the DW-111 are totally enclosed. The safety brake is inside the drum, safe from dirt or dripping water.

These and many other features make the Joy DW-111 the *best* single drum hoist of its class on the market. You will agree after you test its power, versatility and accident-preventing safety brake. ● Write for Bulletin 76-X.

OVER 100 YEARS OF ENGINEERING LEADERSHIP

Consult a Joy Engineer

WAD M 4108

JOY MANUFACTURING COMPANY

GENERAL OFFICES: HENRY W. OLIVER BUILDING · PITTSBURGH 22, PA.

IN CANADA: JOY MANUFACTURING COMPANY (CANADA) LIMITED, GALT, ONTARIO

Are you getting these *Extra Dividends* from Red-Strand preformed wire rope?

DO YOU KNOW that Hercules Red-Strand preformed wire rope consistently lasts longer . . . speeds up operations . . . withstands working conditions?

Does the preformed you use have the right degree of flexibility? Does it have absolutely correct strand clearances?

Are you getting preformed wire rope that is manufactured with the precise care . . . the exacting insistence upon higher-than-rated quality . . . and the specialized craftsmanship that goes into Hercules Red-Strand preformed wire rope?

Find out . . . it means money to you

Leschen wire rope specialists will help you answer these questions . . . to your profit. Ask them . . . before you place your next wire rope order.

Write for free copy of your "Use and Care of Leschen Wire Rope."

*Reg. U.S. Pat. Off.

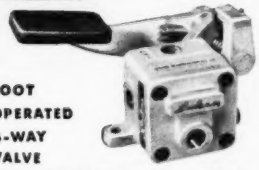
A. Leschen & Sons Rope Co., St. Louis 12, Missouri
In business *only* to make wire rope — *better* wire rope — since 1857.
DISTRIBUTORS IN ALL PRINCIPAL CITIES

Ledeen VALVES

14 Models for Positive, Easy Actuation of Air or Hydraulic Cylinders

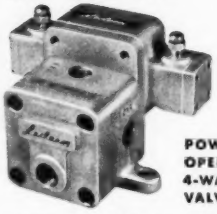
HAND OPERATED 4-WAY VALVE

A simple, economical valve, suitable for most requirements. Requires only light turning effort. Built for long life.



FOOT OPERATED 4-WAY VALVE

Leaves hands free for other work. Requires only light pedal pressure. Works like accelerator throttle. Particularly valuable for women workers.



POWER OPERATED 4-WAY VALVE

For remote control with or without electricity. Can be controlled by microswitch, cam, finger or toe operation.

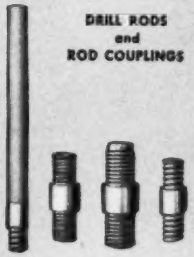
Ledeen Valves embody the rotating disc construction, and are designed for controlling the flow of air, oil or water. They are made in 14 different models for 5 different cycles, in 6 sizes.

Write for Bulletin 510

Ledeen Mfg. Co.
1606 San Pedro
Los Angeles 15, Cal.

For DIAMOND DRILLING SUPPLIES
. . . depend on Longyear

WATER SWIVELS



DRILL RODS and ROD COUPLINGS

DIAMOND BITS and REAMING SHELLS

TRIED AND PROVEN FEATURES, developed through extensive field experience, are continually being incorporated into all Longyear drilling supplies. Whatever your requirements—core barrels or water swivels, drill rods or safety clamps—you can depend on getting the best when you specify . . .

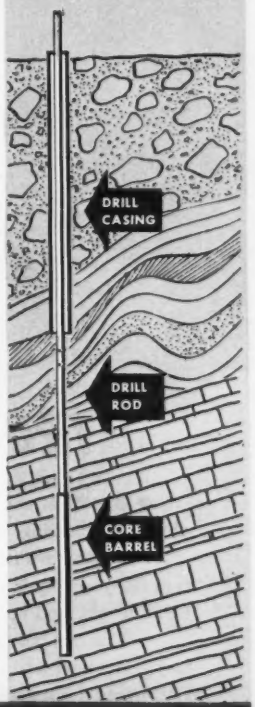
Longyear DRILLING SUPPLIES

- Bits
- Casing
- Core Barrels
- Core Lifters
- Core Splitters
- Deflecting Wedges
- Drill Hole Surveying Instruments
- Drill Rods
- Fishing Tools
- Hoisting Plugs
- Pressure Packers
- Safety Clamps
- Sampling Equipment
- Water Swivels

YOU CAN DEPEND, TOO, on getting the best of diamond bits promptly from Longyear's complete stock of standard core bits, casing bits and shoes and reaming shells. Selected stones, carefully set for maximum efficiency assure you of bits that will cut faster and last longer. Thereby you reduce your over-all costs. Special diamond bits can be obtained on order.

• Longyear engineers, qualified by years of experience, will help you select the tools best suited to your operation. For prompt attention to your requirements write to us TODAY.

SAFETY CLAMPS



E. J. LONGYEAR COMPANY

CANADIAN LONGYEAR, LIMITED, NORTH BAY, ONTARIO, CANADA

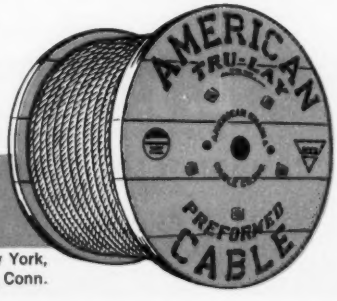
DIAMOND CORE DRILLS • CONTRACT CORE DRILLING
SHAFT SINKING • GEOLOGICAL INVESTIGATIONS

TRU-LAY Preformed WIRE ROPE

● For each use there is *one best* wire rope . . . one that will stand repeated loading, abrasion, crushing, or continuous bending, and be the best rope to buy.

To achieve this, there is a TRU-LAY Preformed Wire Rope made in a special construction for your equipment. This construction has the exactly right combination of strength, bending life, and resistance to wear and crushing that you need.

The one best wire rope . . . TRU-LAY Preformed . . . will last you longer and cost less to use. Specify and get TRU-LAY Preformed improved plow steel—the rope identified by the Green Strand.

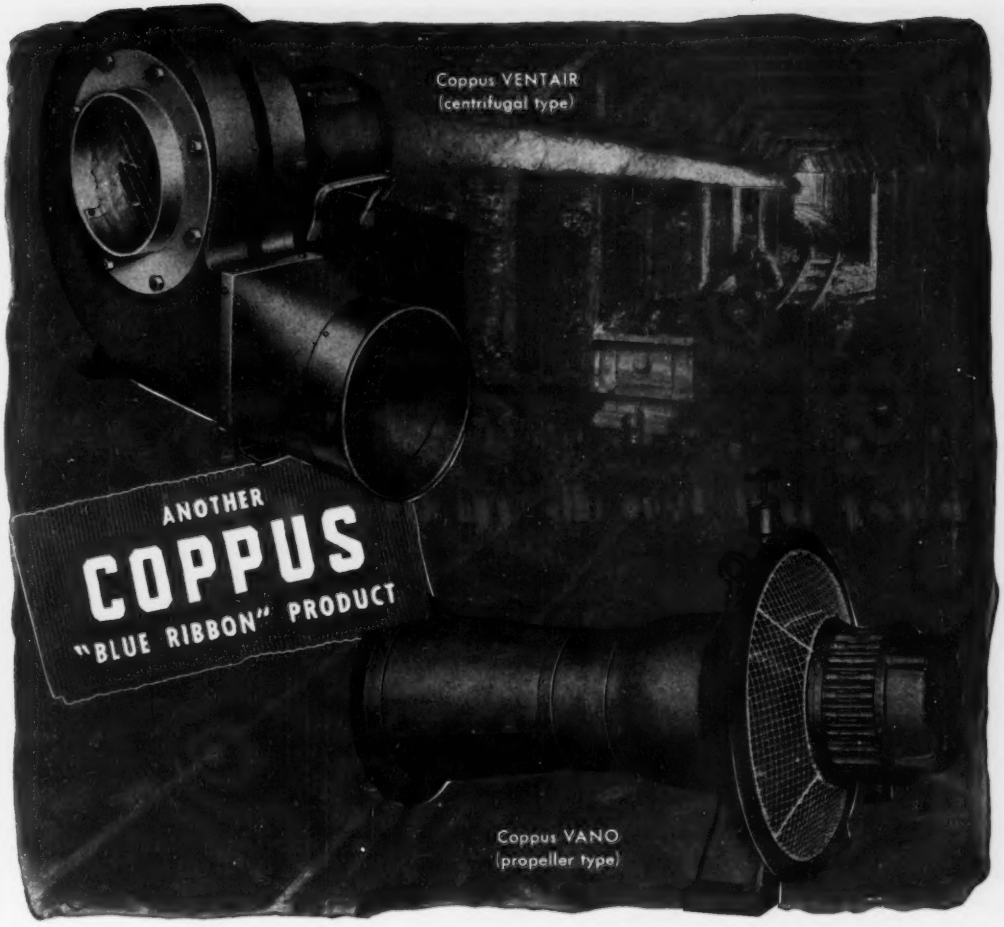


ACCO

TRADE MARK

AMERICAN CABLE DIVISION
AMERICAN CHAIN & CABLE

Wilkes-Barre, Pa., Chicago, Denver, Houston, Los Angeles, New York, Odessa, Tex., Philadelphia, Pittsburgh, San Francisco, Bridgeport, Conn.



Two Blowers . . . One Purpose: 30 to 100% More Air

Why two totally different blower types? Because the requirements of mine ventilation fall into two entirely different categories.

For high pressures, long pipe lines, use the Coppus VENTAIR (centrifugal type). For medium pressures, shorter pipe lines, the Coppus VANO (propeller type) is best. One or the other will give you more air per given power consumption than other blowers — from 30% to 100% more. Can be used as blowers or exhausters, capacities up to 90,000 CFM, with compressed air or electric motor drive.

◊ *Only Coppus makes both types.* And, for quick recognition, each wears the famous "Blue Ribbon," distinguishing mark of top-quality engineering, materials and performance. This blue band is your guarantee of better mine ventilation . . . **Look for it.**

Representatives listed in MINING CATALOGS. Other Coppus "Blue Ribbon" products: steam turbines, gas burners, heat killers, air filters, blowers and exhausters for special purposes. See also THOMAS' REGISTER . . . Coppus Engineering Corporation, 281 Park Ave., Worcester 2, Mass.

COPPUS ENGINEERING CORPORATION
284 Park Avenue, Worcester 2, Mass.

Please send: Bulletin 130.....

Name.....

Company.....

Address.....

How can I do a more effective job of Business Paper Advertising— *without using more money?*

TODAY many companies are faced with the need to promote new products and obtain more intensive market coverage without increasing advertising expense. And as usual Mother Necessity provides an answer—better media selection. In applying media to markets and coordinating advertising with sales plans, all investments should be made on the basis of verified circulation information in connection with dependable market data.

The facts by which the advertising value of publications may be judged are given in the reports issued by the Audit Bureau of Circulations. This cooperative and nonprofit association of 3300 advertisers, advertising agencies and publishers—

1 **Has established standards, definitions and rules that make it possible to measure, evaluate and compare the paid circulations of published media.**

2 **Maintains a staff of experienced and specially trained circulation auditors to audit the circulations of publisher members.**

3 **Issues reports giving advertisers the factual information that is indispensable to economical and effective space buying.**

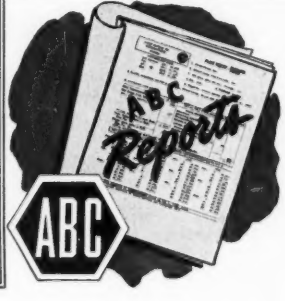
Included in the verified information in A.B.C. reports of business papers is a breakdown of the paid subscribers by occupation or kind of business. Thus advertisers know how much of the circulation goes to the specialized markets in which they are interested, can select media and write copy accordingly.

Other information in A.B.C. reports: How much paid circulation; how much unpaid; where the subscribers are located; what they pay for the publication; whether or not premiums are used; how many subscribers are in arrears; how many subscriptions are renewals.

It is only when media is selected on the basis of such factual information, as provided in A.B.C. reports, that advertisers can be sure of the greatest value for their advertising dollars. That is why this business paper is a member of the Audit Bureau of Circulations. Ask for a copy of our A.B.C. report and then study it.

SEND THE RIGHT MESSAGE TO THE RIGHT PEOPLE

Paid subscriptions and renewals, as defined by A.B.C. standards, indicate a reader audience that has responded to a publication's editorial appeal. With the interests of readers thus identified, it becomes possible to reach specialized groups effectively with specialized advertising appeals.



McGRAW-HILL publications

A.B.C. REPORTS — FACTS AS THE BASIC MEASURE OF ADVERTISING VALUE

Using the RIGHT Wire Rope for the Job?

You'll get longer service life from wire rope if you do. Here are some points to keep in mind when you're selecting wire rope for any equipment . . .

STRENGTH

Don't send a boy to do a man's job. Make sure the wire rope you order has enough strength to take care of the maximum load—*plus* a necessary safety factor.

FLEXIBILITY

If your ropes undergo repeated bending over small sheaves, you'll need a flexible rope with maximum resistance to bending fatigue. Two things increase flexibility—smaller wires and preforming.

ABRASION RESISTANCE

Lang lay ropes, when properly installed, and constructions with large outer wires will help extend the service life of drag lines and other wire ropes that are subject to severe abrasive wear.

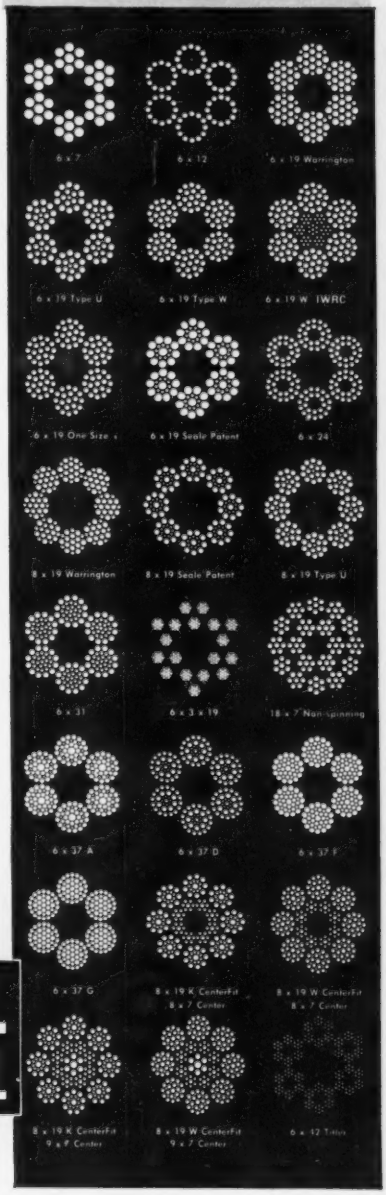
RESISTANCE TO CRUSHING

An independent wire rope center gives outside strands the support necessary to withstand crushing and distortion—large outer wires help spread the load over a greater area.

When you're looking for ways to cut operating costs, why not enlist the help of your nearest J&L Wire Rope representative? He'll help you select the *right* balance of these wire rope properties to get the longest service life on your specific type of equipment and operating condition.

Through years of research and actual operation in the field, J&L has developed a complete line of wire rope sizes and constructions. You'll find it profitable to cash in *NOW* on J&L experience and manufacturing know-how.

Select a Wire Rope that Fits Your Equipment Needs


6 x 7
6 x 12
6 x 19 Warrington
6 x 19 Type U
6 x 19 Type W
6 x 19 W IWRC
6 x 19 One Size
6 x 19 Seale Patent
6 x 24
8 x 19 Warrington
8 x 19 Seale Patent
8 x 19 Type U
6 x 31
6 x 3 x 19
18 x 7 Non-spinning
6 x 37 A
6 x 37 D
6 x 37 F
6 x 37 G
8 x 19 K CenterFit 8 x 7 Center
8 x 19 W CenterFit 8 x 7 Center
8 x 19 K CenterFit 9 x 7 Center
8 x 19 W CenterFit 9 x 7 Center
6 x 12 Tiller

J&L STEEL

JONES & LAUGHLIN STEEL CORPORATION

401 Jones & Laughlin Building • Pittsburgh 30, Pennsylvania

Cummins® Diesels
do so many jobs-so much better

Shovels, cranes, industrial locomotives

Drilling rigs, centrifugal pumps, generator sets

Buses and on-highway trucks

...because they're custom-built to fit the job

Earthmovers, logging yarders and loaders

Off-highway trucks, crawler tractors

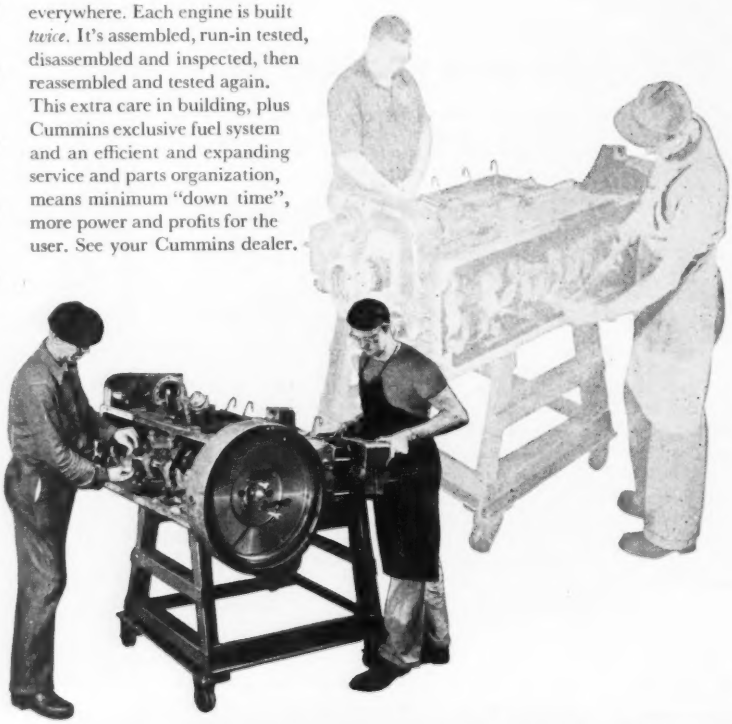
Work boats, pleasure craft

Lightweight, high-speed Diesels (50-550 hp) for these and many other uses

...because they're

BUILT NOT ONCE BUT TWICE

Rugged, lightweight, high-speed Cummins Diesels are at work everywhere. Each engine is built *twice*. It's assembled, run-in tested, disassembled and inspected, then reassembled and tested again. This extra care in building, plus Cummins exclusive fuel system and an efficient and expanding service and parts organization, means minimum "down time", more power and profits for the user. See your Cummins dealer.



CUMMINS Dependable DIESEL

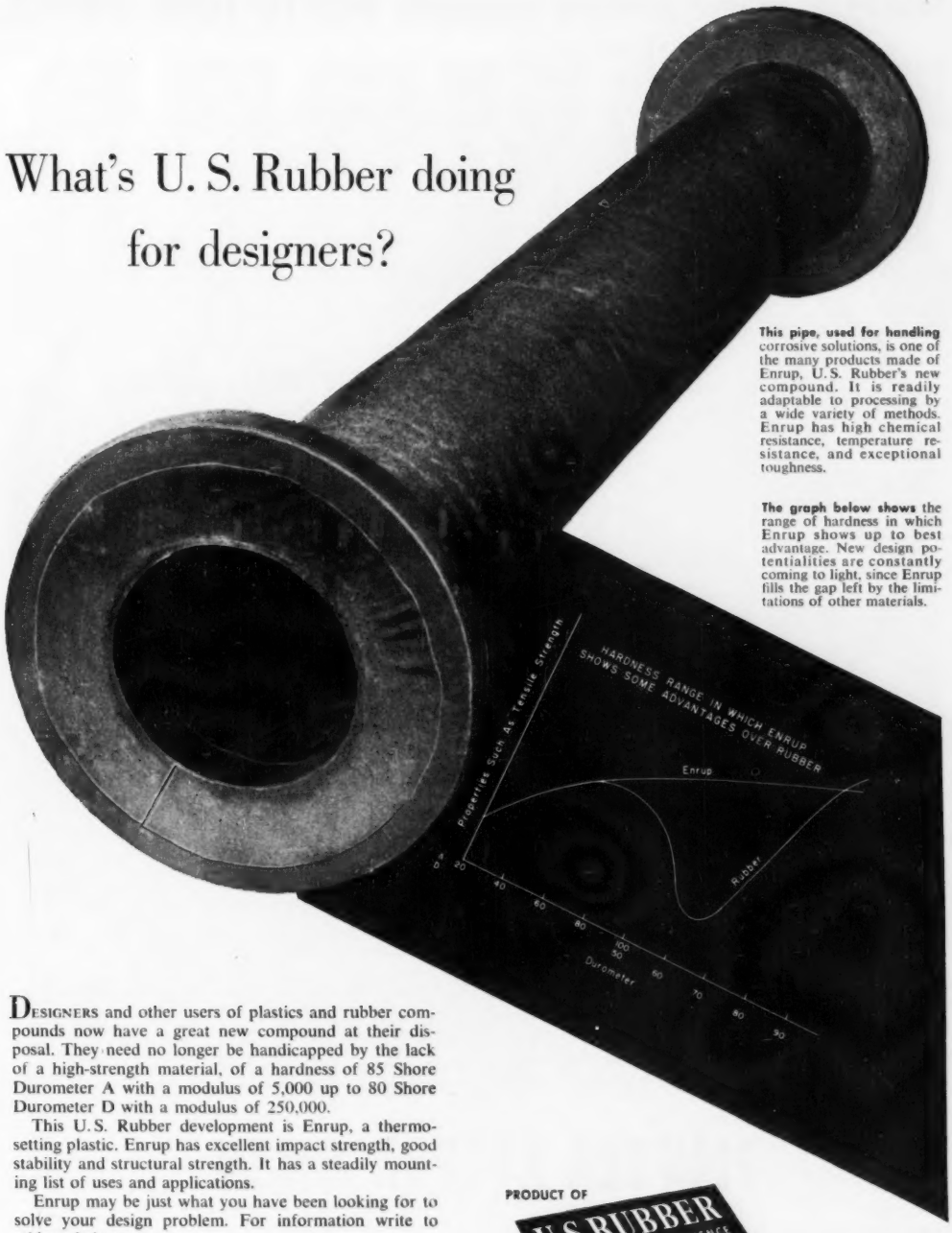
TRADEMARK REG. U. S. PAT. OFF.

Diesel power by CUMMINS

CUMMINS ENGINE COMPANY, INC., COLUMBUS, INDIANA

Export: Cummins Diesel Export Corporation • Columbus, Indiana, U.S.A. • Cable: Cumdiex

What's U. S. Rubber doing for designers?



This pipe, used for handling corrosive solutions, is one of the many products made of Enrup, U. S. Rubber's new compound. It is readily adaptable to processing by a wide variety of methods. Enrup has high chemical resistance, temperature resistance, and exceptional toughness.

The graph below shows the range of hardness in which Enrup shows up to best advantage. New design potentialities are constantly coming to light, since Enrup fills the gap left by the limitations of other materials.

DESIGNERS and other users of plastics and rubber compounds now have a great new compound at their disposal. They need no longer be handicapped by the lack of a high-strength material, of a hardness of 85 Shore Durometer A with a modulus of 5,000 up to 80 Shore Durometer D with a modulus of 250,000.

This U. S. Rubber development is Enrup, a thermosetting plastic. Enrup has excellent impact strength, good stability and structural strength. It has a steadily mounting list of uses and applications.

Enrup may be just what you have been looking for to solve your design problem. For information write to address below.

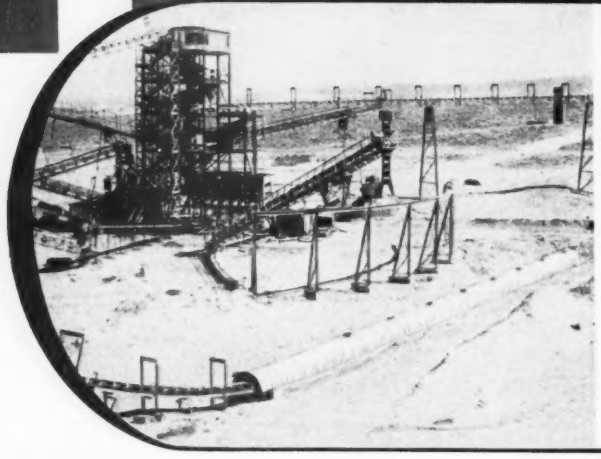
PRODUCT OF
U.S.RUBBER
SERVING THROUGH SCIENCE

UNITED STATES RUBBER COMPANY

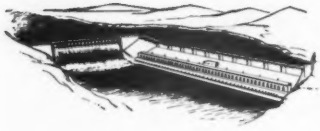
MECHANICAL GOODS DIVISION • ROCKEFELLER CENTER, NEW YORK 20, N. Y.

Industrial rubber products especially built for LONG SERVICE

PIONEER



Pioneer Belting selected for 3,000,000 ton aggregate job



Part of the plant which will furnish rock and sand for Chief Joseph Dam.

Three million tons of crushed rock and sand will be used in the building of Chief Joseph Dam, now under construction on the Columbia River.

A most unusual crushing, screening, and washing system is in use, and thousands of feet of Pioneer Conveyor Belting keep the operation on schedule. Every hour, 400 tons of aggregates are carried to the concrete batching plant, which will produce 1¾ million cubic yards before the job is finished.

Extreme summer heat, winter cold, moisture, abrasion, and gouging—these are some of the things this Pioneer Belting is built to withstand. Like Pioneer Conveyor Belting used on other difficult construction jobs, it will turn in a fine performance record.

Pioneer Rubber Mills has had 63 years of experience in engineering industrial rubber goods for *long life* under the most exacting conditions.

Call your nearest Pioneer representative. He will be glad to give you any information you require—fast!

Send for Pioneer's newest booklet, "METABOND," a complete handbook on rubber linings, coverings, rubber covered rolls.

PIONEER RUBBER MILLS

Pioneering in rubber since 1888

BRANCHES: CHICAGO • CLEVELAND • DALLAS
LOS ANGELES • MILWAUKEE • ST. LOUIS • SAN FRANCISCO

FACTORIES: PITTSBURG, CALIFORNIA

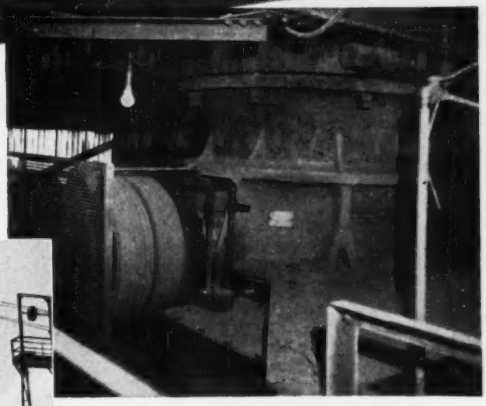
BELTING • INDUSTRIAL HOSE • FIRE HOSE • PACKINGS
RUBBER COVERINGS AND LININGS, SPECIALTIES

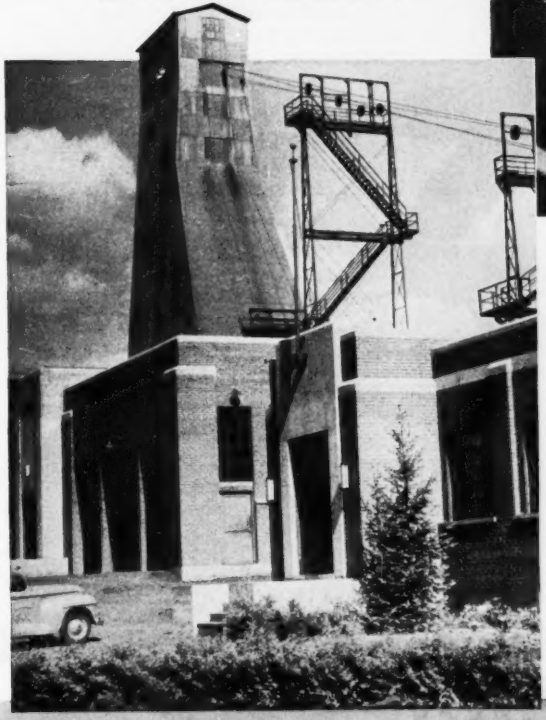
MAIN OFFICE: 345-353 SACRAMENTO STREET, SAN FRANCISCO 11

Distributors in other principal cities

OVER 3,000,000 TONS HAVE BEEN CRUSHED by this TELSMITH

The 13-B Telsmith Gyratory Crusher is located in the upper part of the 135-ft. steel headframe shown below.





● An important iron ore producer in the Iron River district of the Menominee Range in Michigan finds his Telsmith Gyratory Crusher to be exceptionally economical.

Installed in 1942, this Telsmith 13-B Crusher handles about 35,000 tons of ore per month, and to date has crushed over 3,000,000 tons. Crusher upkeep expense has been exceedingly low, consisting of only one set of eccentric bearings and some very minor parts. For details on Telsmith's bigger capacity and lower upkeep, get Bulletin 271.

Mn.-34

SMITH ENGINEERING WORKS, 502 EAST CAPITOL DRIVE, MILWAUKEE 12, WISCONSIN

Cable Address: Sengworks, Milwaukee

Samuel Osborn (S. A.) Ltd., Johannesburg, So. Africa • Armco International Corp., Buenos Aires, Argentina
51 East 42nd St., New York 17, N. Y. | 211 W. Wacker Dr., Chicago 6, Ill. | Mine & Smelter Supply Co., Denver 17, Colo. | Mines Eng. & Eqpt. Co., San Francisco 4, Calif.
Ontario Eqpt. & Supply Ltd., Toronto, Canada • Mussens Canada Ltd., Montreal, P.Q. • Gordon Russell, Ltd., Vancouver, B. C.

FOR TOUGH GOING

Even when the going gets tough—with rough ragged holes, rugged terrain, continuing rains, flooded pits — Primacord comes through with plenty of good digging. For there's a grade of Primacord to meet every blasting condition—*Reinforced* for very deep holes requiring high tensile strength; *Wire Countered* where there's high abrasion; *Plastic Reinforced* where water or acids are present.

The men like it, too. It comes in convenient spools; it's light in weight; easy to hook up for main and down-hole lines — just tie a half hitch — and it's safe to handle.

Primacord is not affected by stray currents nor can it be set off by friction, sparks, or ordinary shock — it requires a blasting cap to detonate it.

Under all conditions it pays to

"Hook Up and Detonate with PRIMACORD"

Ask your explosives supplier
or write us direct for further facts

THE ENSIGN-BICKFORD COMPANY
SIMSBURY, CONNECTICUT

Also Safety Fuse since 1836

Made in several types. **PLAIN PRIMACORD** for shallow holes and surface trunk lines; **REINFORCED PRIMACORD** for deep holes and resistance to abrasion; **WIRE COUNTERED PRIMACORD** for deep, ragged holes; and **PLASTIC REINFORCED PRIMACORD** for deep, wet holes and river crossings.

Use PRIMACORD®

The PROVED and APPROVED DETONATING FUSE

OUR 60TH ANNIVERSARY

Your

Visible Proof of Invisible Quality

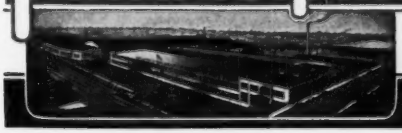
Be sure it's . . .

You can't check the bronze or analyze the steel or examine the fits between mating parts of a speed reducer. But you can count on the name of the manufacturer. The name Philadelphia on a product means 60 years of experience in making power transmission equipment. It stands for a company that builds all types and sizes of speed reducing units.

The worm gear reducer shown here is just one unit of a complete line that is built from 3" to 21" gear centers in a wide variety of horizontal and vertical styles. Ratios from 3 5/8:1 to 6300:1 cover any application.

Send for our latest catalog WG-51 which shows complete details of the worm gear units. Please use your business letterhead.

Philadelphia Gear Works, INC.



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NEW YORK • PITTSBURGH • CHICAGO • HOUSTON • LYNCHBURG, VA.
IN CANADA: WILLIAM AND J. G. GREEY LIMITED, TORONTO

Industrial Gears and Speed Reducers
LimiTorque Valve Controls

BECKMAN

—and only Beckman—

provides such wide range versatility in Glass pH Electrodes . . .

The importance of modern pH equipment is widely recognized in many fields . . . from food processing to sewage treatment—mining and smelting to electroplating—textile manufacturing to sugar refining. But when considering pH equipment for *your* problems always remember this . . .

"No pH meter is better than electrodes designed for use with it!"

Only Beckman provides such a wide variety of versatile, accurate and dependable electrodes—a type to meet virtually *every* industrial, research, laboratory and medical requirement. This is your assurance that, in Beckman pH equipment, you have maximum adaptability to widely-varying pH applications.

FREE . . . a convenient 28-page catalog illustrating the complete line of Beckman electrodes and pH equipment is available from your authorized Beckman Instrument dealer. Or write direct!

Whatever your pH electrode requirement, contact Beckman.

BECKMAN INSTRUMENTS INC

SOUTH PASADENA 14, CALIF.

Factory Service Branches: Chicago • New York • Los Angeles

Beckman Instruments include: pH Meters and Electrodes—Spectrophotometers—Radioactivity Meters—Special Instruments

Typical Advantages of Beckman Electrodes

Virtually Unbreakable

Where abrasive slurries or rough industrial service are problems, Beckman has the answer with electrodes so strong, so tough, so chemically-resistant to alkalies and acids they set entirely new standards of durability!

Extreme Temperatures

Want to make measurements in solutions as cold as 20°C. *below* zero . . . or as hot as 130°C. *above*? Hot, cold or in-between, there's a Beckman pH Electrode to do the job!

Wide pH Range

Electrodes covering the full pH range permit accurate measurements even at extreme limits with negligible sodium ion error whether test solution is hot or cold!

Unique Construction

Beckman glass electrodes are factory-sealed, require no maintenance, feature patented internal shielding, heat-resistant construction, integral leads and many other advantages!

WILLSON

comfortable eye protection

keep on the safe side

wear WILLSON GOGGLES

Willson goggles offer you greatest value because they are carefully designed for comfort and appearance as well as for the eye protection you need. Choose from a wide range of Cup and Cover-All* types like those illustrated. All are fitted with Super-Tough* heat-treated glass lenses—all fully pre-tested. You're sure when you ask for Willson goggles—safer when you wear them.

COVER-ALL® CUP GOGGLE No. CC60

Heavy duty goggles allowing plenty of room for prescription glasses to be worn safely and comfortably.

RUBBER MASK GOGGLE No. X41

Ideal for chemical workers. Rolled inner edge makes them fit snugly with utmost ease.

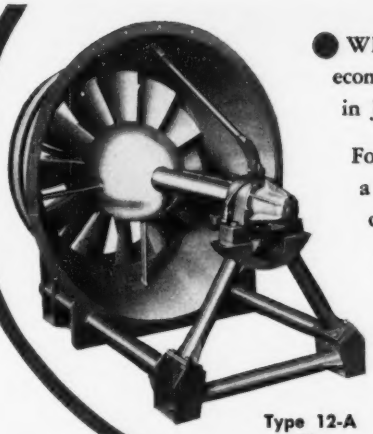
STYLE DL31

Deep perforated metal cups provide direct ventilation yet exclude dust. Ideal for use in hot, dusty atmospheres.

See your Willson distributor or write for bulletin

WILLSON PRODUCTS, INC.

225 Washington St., Reading, Pennsylvania

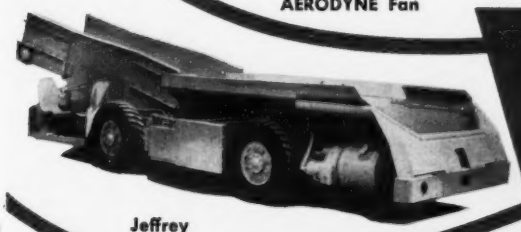


Type 12-A
Jeffrey
AERODYNE Fan

● Whether a question of proper ventilation or the most economical method of transportation you will find the answer in Jeffrey engineered equipment for Metal Mine operation.

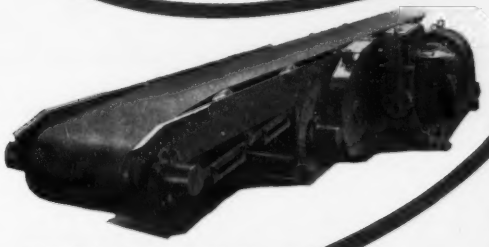
For instance, the Jeffrey 12-A AERODYNE Fan operates at a lower speed yet still maintains the high efficiencies characteristic of these ventilation units over many years. And for low cost transportation Jeffrey offers sturdy, long-lived Locomotives (trolley or storage battery), Belt Conveyors and Shuttle Cars depending upon the nature of your operation.

There is a Jeffrey engineer available to help you. Consult him on your needs.

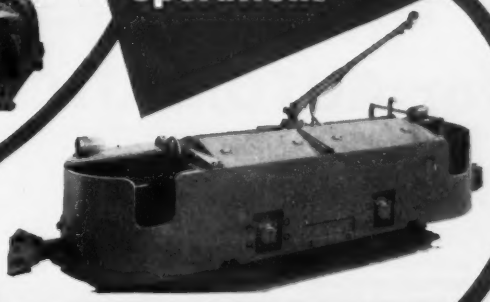


Jeffrey
Shuttle Car

JEFFREY
EQUIPMENT
assures lower costs for your metal mine operations



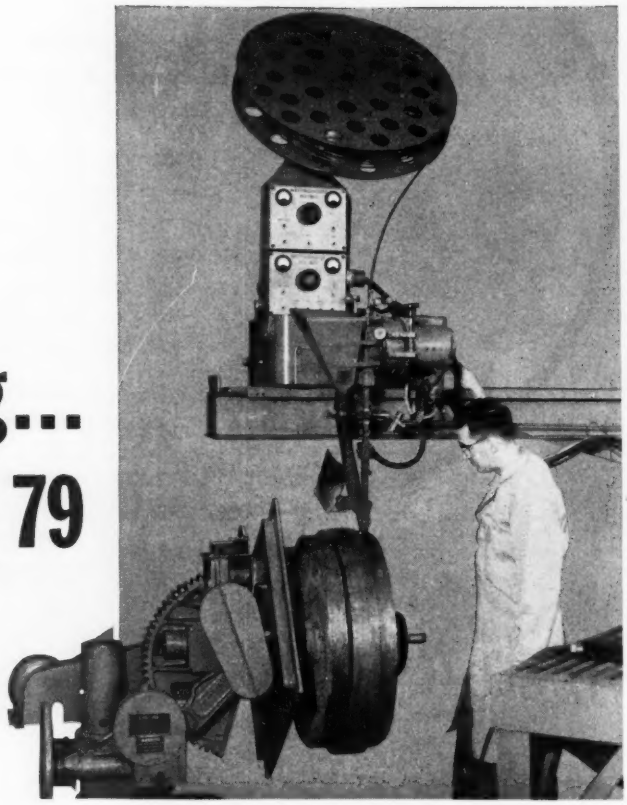
64-A Belt Conveyor Head



Trolley Type Haulage Locomotive

THE **JEFFREY** MANUFACTURING COMPANY
974 North Fourth St., Columbus 16, Ohio
Established 1877

Complete line of Material Handling, Processing and Mining Equipment



Announcing... Amsco AW 79

for AUTOMATIC HARDFACING

AMSCO AW 79 will meet your every requirement for better control of wear where abrasion and high impact are important factors—plus giving you all the advantages of automatic welding. It can be used for reclaiming parts worn to uselessness or for increasing productivity of new parts.

The result of extensive research and field testing, AMSCO AW 79 is especially suitable for rebuilding and hardfacing tractor rollers and idlers. Back-up rolls, steel wheels, sheeting rolls, dredge pins, as well as dozens of other applications, can be successfully hardfaced with AW 79. It can be used on any conventional automatic submerged arc welding equipment now being used.

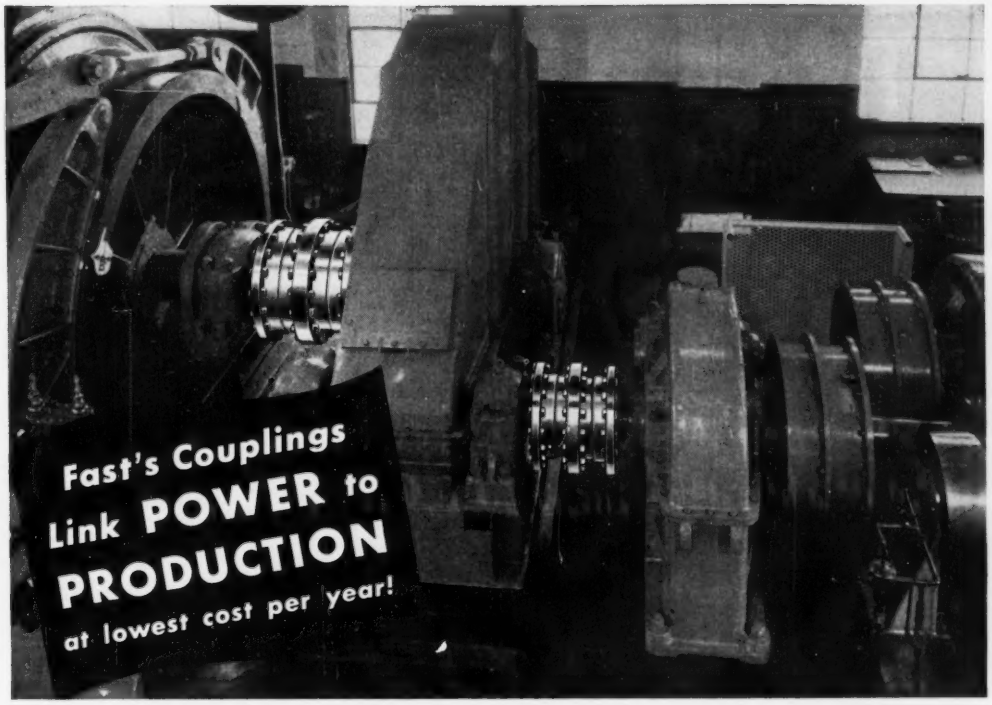
AW 79, the first in a series of rods by AMSCO for automatic hardfacing, is an alloy steel electrode fabricated by encasing particles of alloy metals in a continuous steel tube. Deposits are of martensitic alloy steel with chromium and molybdenum as the principal alloying agents. It is available in coils weighing approximately 100 lbs., each with an inside coil diameter of 22½", and is stocked in wire diameters of 5/32" and 3/16". Packed in cardboard containers with an anti-rust agent, other coil diameters and sizes are available on request. Write today for complete information.

AMERICAN Brake Shoe COMPANY

AMERICAN MANGANESE STEEL DIVISION

376 EAST 14th STREET · CHICAGO HEIGHTS, ILL.

Other Plants: New Castle, Del., Denver, Oakland, Cal., Los Angeles, St. Louis. In Canada: Joliette Steel Division, Joliette, Que.
Amsco Welding Products distributed in Canada by Canadian Liquid Air Co., Ltd.



FAST'S Couplings usually outlast the equipment they connect!

ACTUAL cases on record show many Fast's Couplings are still in service after as much as 30 years of continuous operation! Time and time again, equipment has been replaced while the original Fast's Coupling remained on the job.

To you, these records of dependable, trouble-free service mean freedom from costly coupling failures when you specify Fast's. And they mean Fast's cost you far less to own and operate . . . because their cost can be amortized over long years of dependable performance.

For full details on how Fast's Couplings and Koppers Engineering Service can help you, write today for a free copy of our catalog to: KOPPERS COMPANY, INC., *Fast's Coupling Dept.*, 294 Scott St., Baltimore 3, Maryland.

Here's How FAST'S Save You Money

Free Service—Koppers free engineering service assures you the right coupling for the job.

Rugged Construction—Fast's still maintains its original design, without basic change or sacrifice in size or materials. Result: freedom from expensive coupling failures.

Lowest Cost per Year—Fast's Couplings usually outlast equipment they connect. Their cost may be spread over many years!

KOPPERS®

FAST'S
THE ORIGINAL
GEAR-TYPE
Couplings

INDUSTRY'S STANDARD FOR 32 YEARS

KOPPERS COMPANY, INC., *Fast's Coupling Dept.,*
294 Scott St., Baltimore 3, Md.

Gentlemen: Send me Fast's Catalog which gives detailed descriptions, engineering drawings, capacity tables and photographs.

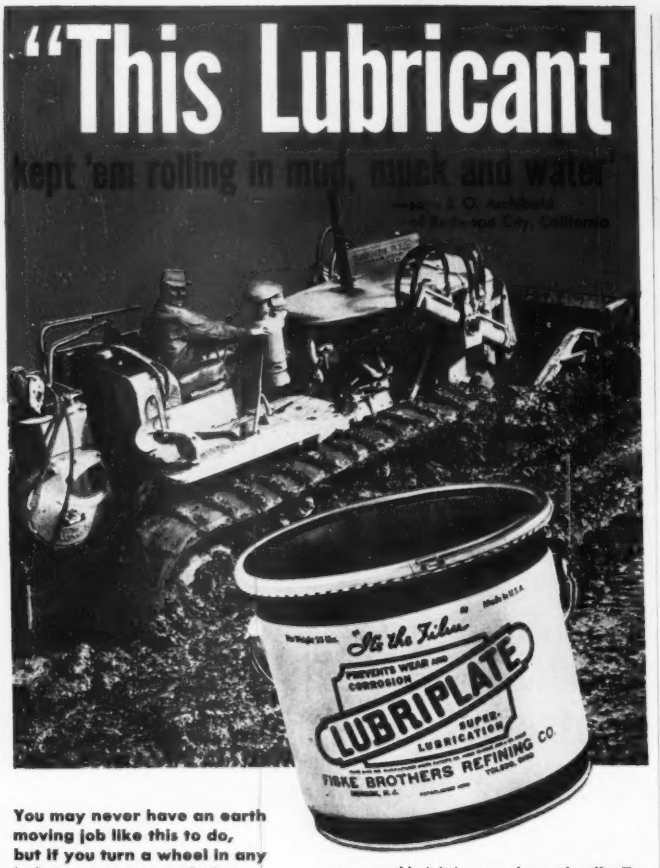
Name _____

Company _____

Address _____

City _____ *Zone* _____ *State* _____

"This Lubricant kept 'em rolling in mud, muck and water"



You may never have an earth moving job like this to do, but if you turn a wheel in any industry you can profit from Mr. Archibald's experience.

"The Leslie Salt Company called for bids for the conversion of 500 acres of salt marsh into crystallizing ponds for the production of bulk salt. The going was so tough that none of the several contractors invited to bid would take the job on a fixed price contract. Due to our success on similar work, the job was given to us on a cost plus basis.

"We moved in eighteen tractors as power units and the necessary Carryalls, Sheep Foots, Jeeps and other equipment. As soon as we removed the upper crust there was nothing but peat and marsh to run on. Tractors would sink in over the track rolls. To keep equipment rolling would require a special lubricant.

"Knowing from past experience that LUBRIPLATE No. 107 not only reduced friction to a minimum, but it also prevented rust even in salt water and would seal out the muck, we adopted it for track and general lubrication. We selected LUBRIPLATE APG-140 for all transmissions and final drives. The effectiveness of these two LUBRIPLATE Products is evidenced by the fact that during the entire job there were no replacements of track rollers nor were there any tie-ups of equipment due to replacement or breakage."

J. O. Archibald

Yes, LUBRIPLATE Lubricants are different!

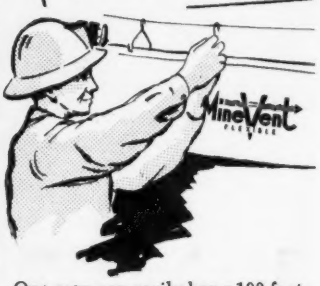
They reduce friction, wear and power consumption, prevent rust and corrosion and last longer than ordinary lubricants. LUBRIPLATE Lubricants are available from the lightest fluids to the heaviest density greases. There is a LUBRIPLATE Product best for your every lubrication need. Write for information about the use of them in your industry.

LUBRIPLATE DIVISION—Fiake Brothers Refining Company, Newark 5, N. J., Toledo 5, Ohio.

DEALERS EVERYWHERE—SEE YOUR CLASSIFIED TELEPHONE BOOK

LUBRIPLATE *THE MODERN LUBRICANT*

Makes Tubing Installation a *Breeze!*



One man can easily hang 100 feet of ABC Mine-Vent Tubing an hour. Here's why: Mine-Vent's patented snap-on couplings take only seconds to join sections . . . the joint is airtight. To hang Mine-Vent, simply string a messenger wire along roof, wall or timbers, slip Mine-Vent's simplified hangers into the tubing and attach to the wire.

The result is cooling fresh air brought to the working face as fast as the work progresses—with less time and effort to get it there. For improved ventilation at less cost write **AMERICAN BRATTICE CLOTH CORP.**, 220 Buffalo Street, Warsaw, Indiana.

"Canned" for your convenience

Durable, easy-to-handle fiber drums keeps MineVent in perfect condition until you need it

MineVent Tubing

Mack six-wheelers get you *out of the rough*

Rough terrain or hub-deep mud holds no terrors for Mack six-wheel trucks. You can count on these unfaltering Macks to take your loads "out of the rough"... to maintain steady, dependable schedules... because they have the unique advantage of Mack's *Balanced Bogie with exclusive Power Divider.*

With the Mack Power Divider, a non-spinning true differential, torque is divided between the two bogie axles and between the four driving wheels. Delivering torque smoothly and continuously without destructive shock in proportion to wheel traction, the Power Divider stops power waste through useless slipping and wheel spinning–keeps Macks moving where other trucks bog down.

If your present truck equipment is having a hard time because of hard going, it will pay you to investigate the benefits you get from Mack six-wheelers in unfailing reliability and uninterrupted production... greater profits through greater output at lower cost. Write or call your nearest Mack branch or distributor.

Mack Internal Power Divider

Mack TRUCKS

last them all

Mack T... Empire State Building, New York 1, N. Y. Factor... nches and distributors in all principal cities for ser... and parts. In Canada: Mack Trucks of Canada, Ltd.

In tough dump truck service Mack six-wheelers get you "out of the rough" with unfailing dependability.

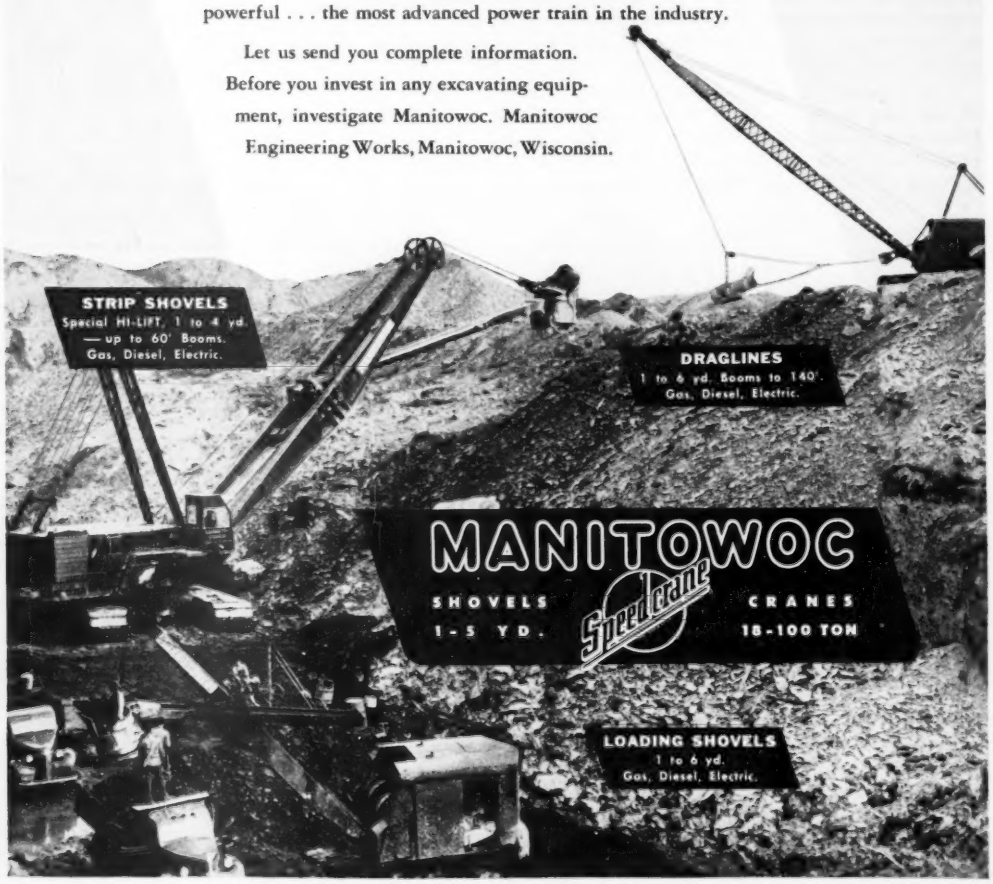
MANITOWOC

for every mining job

Excavating equipment is the key to lower mining costs . . . the big factor between profit and loss on an operation. That's why leading mine operators are selecting Manitowocs for stripping, excavating, loading and handling.

You'll find Manitowocs specially designed and built for mining . . . with big capacity and long reach . . . rugged, yet simple and easy to operate . . . big and powerful, yet extremely fast. And Manitowocs also give you the famous TORQUE CONVERTER drive . . . smooth, tenacious, shock proof, powerful . . . the most advanced power train in the industry.

Let us send you complete information. Before you invest in any excavating equipment, investigate Manitowoc. Manitowoc Engineering Works, Manitowoc, Wisconsin.


STRIP SHOVELS
Special HI-LIFT, 1 to 4 yd. — up to 60' Booms. Gas, Diesel, Electric.
DRAGLINES
1 to 6 yd. Booms to 140'. Gas, Diesel, Electric.
MANITOWOC
SHOVELS 1-5 YD.
Speed Crane
CRANES 18-100 TON
LOADING SHOVELS
1 to 6 yd. Gas, Diesel, Electric.

Miners Coal Company reports that

Reinforced with Du Pont "Cordura," this belt (above) operates at 383 feet per minute up a 17-degree slope, delivering 525 tons of coal per hour. During its operation it has never been necessary to stop it for attention or repairs; and the belt has not stretched enough to be noticeable.

The slope belt lifts the coal 281 feet vertically to the large, modern tipple of the Miners Coal Company. It is 948 feet between centers. In foreground is Manager Kenneth Snarr.

Thinner belt reinforced with "Cordura" rayon trains better, loaded or empty

This 36" slope belt trains perfectly even when empty, according to Kenneth Snarr, Manager of Miners Coal Company, Madisonville, Ky. It was manufactured by the Manhattan Rubber Division of Raybestos-Manhattan, Inc., on a carcass made of Du Pont Cordura* High Tenacity Rayon.

The reason belts reinforced with "Cordura" train better is simple. "Cordura" rayon yarn is so much stronger than natural fiber yarns it permits a thinner belt with fewer plies. *Greater strength with less bulk.* These thin belts are naturally more flexible. So they train better. And the low stretch of "Cordura" yarn saves expensive shutdowns for take-up and resplicing.

Inquire about the advantages of belts reinforced with "Cordura" High Tenacity Rayon before you order your next conveyor belt. We'll be glad to send you the names of suppliers . . . also complete information about "Cordura" rayon. Just send for the *free* booklet, "Sinews for Industry." Address: Textile Fibers Department, Room 4421, E. I. du Pont de Nemours & Co. (Inc.), Wilmington 98, Delaware.

*REG. U.S. PAT. OFF.

Du Pont "Cordura" High Tenacity Rayon

STRENGTH AT LOW COST

DU PONT

REG. U.S. PAT. OFF.

150th Anniversary

BETTER THINGS FOR BETTER LIVING . . . THROUGH CHEMISTRY

. . . YET SCRAP INVENTORIES ARE ALARMINGLY LOW. *YOU* ARE BEING COUNTED ON TO HELP KEEP THE FURNACES WORKING . . . TO AID DEFENSE

With our increased steel production, the furnaces are gobbling up an enormous amount of iron and steel scrap.

More—far more—scrap than is at present going into their scrap stockpiles.

Many mills are operating on a hand-to-mouth basis. Some are already threatened with shut-down—for lack of scrap.

The Danger Is Increasing

Will efforts to fill the tremendous demands for steel fail because of lack of scrap?

Steel is made from 50% scrap. We could be severely handicapped—in our aim to keep abreast of both military and civilian requirements—if scrap suppliers can't keep pace with productive capacity.

But they *can* keep pace . . . with your help!

Enough Scrap IS Available!

Yes—the only problem is to get the available extra scrap from where it is—to where it's needed.

Where is it?

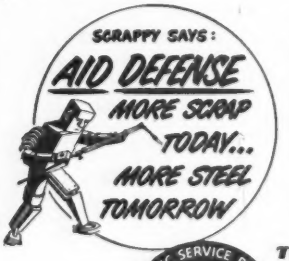
In *your* business . . . in the form of old machines and equipment, tools, implements, dies, jigs, fixtures, outmoded structures, chains, valves, wheels, pulleys—any old iron and steel that's rusting away.

Six Million EXTRA Tons Needed!

By the end of 1952, we'll be producing steel at an annual rate of 20 million tons more than in 1950. That means we will need at least 6 million more tons of scrap than we've ever needed before.

It's up to you. Write at once to Advertising Council, 25 W 45 St., New York 19, N. Y., for a free copy of "Top Management: Your Program For Emergency Scrap Recovery".

Please write today—there's not a day to lose.



NON-FERROUS SCRAP IS NEEDED, TOO!

This advertisement is a contribution, in the national interest, by

McGRAW-HILL PUBLISHING COMPANY, INC.

330 WEST 42nd STREET NEW YORK 18, N.Y.

A double check THAT SINGLES OUT B-G BELT CARRIERS

BUILT FOR LONGER BELT LIFE, LESS CARRIER MAINTENANCE...

Check the B-G Belt Carrier design and you'll find a combination of features that means long, low-cost service. Carrier rolls, for instance, stand out under rigid comparison: ¾" shafts . . . large, high-capacity ball or roller bearings . . . 100% welded and finished hubs . . . labyrinth grease seal . . . all are evidence of highest quality manufacture. Rolls are mounted on a heavy angle steel base with built-in 2° tilt for automatic belt training to assure continued accurate belt alignment and minimum belt wear.

If you are faced with Belt Carrier replacement — or if you're thinking of a new belt conveyor — get the full story on how Barber-Greene Carriers will stay true and smooth-running through more years of service.

B-G Carrier rolls are made of heavy steel tubing of uniform wall thickness with roll ends welded 100%.

OVER 80 STOCKING DISTRIBUTORS

Rolls are mounted on all steel, jig-welded self-shedding angle.

Also, fast, reliable B-G Distributor service can help prevent shutdowns and minimize time lost when conveyor trouble occurs — many carry B-G Belt Carriers in stock, available for fast delivery.

Your B-G Distributor offers carriers in three roll diameters (4", 5", 6")—and in 18", 24", 30", 36" and 42" widths. These as well as impact and self-aligning B-G Carriers are fully described in Catalog 76C. Write for your copy.

201

Barber-Greene

Magnetic Separators More Efficient With Speed-Trols

Speed-Trols give us the infinite and accurate control of drum speed needed to get maximum extraction of ferrous materials with the Magnetic Drum Separators we manufacture... accurate control of drum speed is essential in order to efficiently process materials having a wide range of magnetic response, reports G. Shister, Design Engineer, F. W. Shrader Co., Culver City, California.

STERLING SPEED-TROL

GIVES YOU VARIABLE SPEED CONTROL NECESSARY FOR:

Equipment adaptation to: Sequence synchronization — operators' abilities — load variations due to differences in quantity, quality, weight, size, tension, hardness or shape of material to be processed, machined, conveyed, blended, mixed, etc.

Process control of: Temperature—viscosity—level—pressure—flow—etc.

Time control of: Baking—drying—heating—cooking—pasteurizing—soaking—chemical action—etc.

With Speed-Trol you get the maximum in production, plant efficiency, quality & profit.

70 ILLUSTRATIONS showing how Sterling Electric Power Drives reduce production costs. Write for Bulletin No. A 124

STERLING
ELECTRIC MOTORS

Plants: New York City 51; Van Wert, Ohio; Los Angeles 22; Hamilton, Canada; Santiago, Chile
Offices and distributors in all principal cities

PICK YOUR POWER with

The NEW Acker Teredo Core Drill...

No temperamental prima-donna is Acker's new, versatile Teredo Core Drill—*it performs efficiently with any power plant.*

And for dependable, low-cost, trouble free operation anywhere in the world—Acker design and construction can't be beat.

See for yourself—write for Bulletin 33, EMJ.

Over 30 years' experience in the design and development of Drilling Equipment.

ACKER DRILL CO., INC.
SCRANTON 3, PA.

drilled to over 100 feet depth

Uniform Gauge Holes

***with* ROK-BIT TUNGSTEN CARBIDE BITS, ADAPTERS, COUPLINGS**

These tools are engineered to last longer, in any formation now drilled with standard rock bits—drill faster—and keep hole in alignment. This cost-cutting performance proved in over twelve months of continuous field operation. Tools are easy to change—self-cooling and self-cleaning. Standard diameter holes — 1⅞" and 3". Write for bulletin EMJ452. Rock Bit Sales & Service Co., 2514 E. Cumberland St., Phila. 25, Pa. 350 Depot St., Asheville, N. C.

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CARBIDE ROK-BITS • INTRA-SET DRILL STEEL
ALL TYPES OF HOLLOW DRILL STEEL • LONG HOLE DRILLING TOOLS • HOLE-SAVERS

Let's See Why This Belt Conveyor Pulley is Best—For You

The pulley equipment on your belt conveyors or elevators has a lot to do with their performance. American steel Conveyor Pulleys, designed from research, are built by tested, controlled, precision methods, to treat belts extra well while themselves standing up indefinitely to the wear, tension and torsion imposed on them. Truly they are *Built* for the *Belt!*

Four standard constructions . . . more than 400 sizes from 6″ x 12″ to 60″ x 63″, for ½″ to 10″ shafts. Totally enclosed—dirt and splashproof—they are very light, size for size, yet unbreakable.

Rims are accurately formed of metal thickness to suit pulley size and service. Crowned or straight across entire face—whichever promotes longest belt life.

Exclusive disc and hub construction: Discs don't break, hubs don't wear nor walk on shafts, pulleys are concentric, keyways positively in line. Advanced welding techniques provide extra strength and maximum penetration at all joints.

NEW! Exclusive GRIPLEX® *Spiralagging.* Extra strong duck with top quality, extra thick rubber anchored to pulleys by special adhesive and just a few bolts—countersunk for long life and better belt protection.

NEW! "HD" *heavy-duty* pulleys with Wedg-Tite hubs have a bulldog grip on shafts

Four Types of Conveyor Pulleys by American—all Built for the Belt!

TYPE "O"—split type for mounting in tight spots like elevator casings.

TYPE "L"—for light duty—top quality at minimum cost.

TYPE "N"—for general duty—interchangeable hubs make installation or relocation easy . . . hubs tapered-fit for more efficient torque transmission—minimum bolt strain.

TYPE "HD"—for heavy duty—split tapered hubs have positive clamp grip on shaft . . . speed installation or removal.

Pulleys available almost everywhere from local distributors—backed by large factories and warehouse stocks.

Conveyor Pulleys by American—Built for the Belt!

Power Transmission by

AMERICAN

PULLEY COMPANY

The American Pulley Company
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Please send me your bulletin on the American all steel Conveyor Pulley line.

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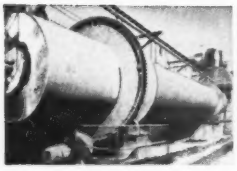
cut down on
drying expenses...with a
LOUISVILLE DRYER
by
General American



Louisville Rotary Cooler with rotary shell and external water sprays.

Louisville Rotary Steam-Tube Dryer —indirect type using steam as heating medium, and utilizing 85% of that steam for useful work.

There is a LOUISVILLE DRYER for better drying in the following industries: Brewing • Canners By-Products Chemical • Distilling • Fertilizer • Fisheries • Feeds • Foods Mining • Packing House Products • Wood Products

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More than once, a Louisville Dryer has turned a losing operation into a profitable one. Write or call for a Louisville engineer to make an obligation-free survey of your operation.

Steel

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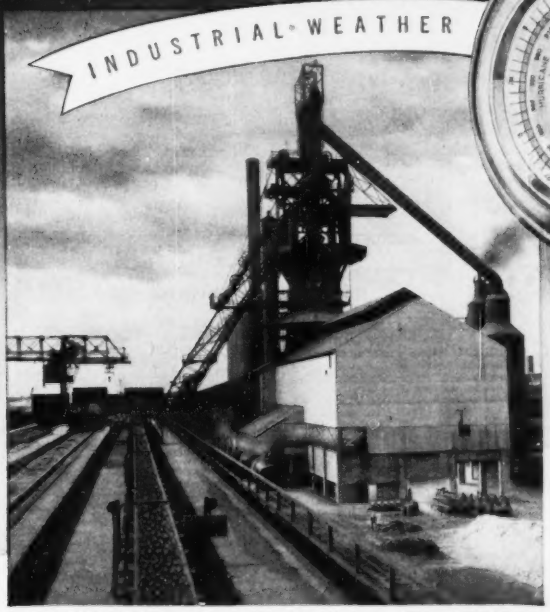
BAROMETER OF INDUSTRIAL WEATHER



Sheffield Blast Furnace—First to utilize Texas iron ore and coke from Oklahoma coal in a fully integrated at-home steel making operation.

Look at the activity of steel making and you look at a dependable business forecast.

West of the Mississippi and East of the Rockies, good business weather has long been reflected in the ever expanding facilities and activities of Sheffield Steel.

Within the last ten years, Sheffield's at-home steel making capacity has more than doubled. Sheffield Steel has expanded into a fully integrated at-home steel making operation from mining the raw materials to mill finished and fabricated steel products.

Look at the Sheffield customer list and you see the names of the leaders in manufacturing, agriculture, transportation, construction, oil, etc. With them, Sheffield Steel is proud to march in step with the greatly accelerated growth of what very aptly has been termed—the inner stockade of the garrison for freedom.

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CORPORATION
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Grinding Balls
USED and PROVED ALL AROUND THE WORLD

IRON AND STEEL *SCRAP* MEANS . . . . . .

MORE STEEL FOR AMERICA
More Money In Your Pocket!

GET YOURS OFF TO
THE DEFENSE LINES NOW!

Washed iron ore is stacked at rate of 600 long tons per hour by this 570 ft. track-mounted trailer belt conveyor (fed by fixed belt conveyor) and Link-Belt 115 ft. radius revolving, self-propelled stacker, which can make storage pile 42 ft. high.

Rely on one source... one responsibility for the best in belt conveyors

LINK-BELT engineering experience plus quality components combine to cut handling costs

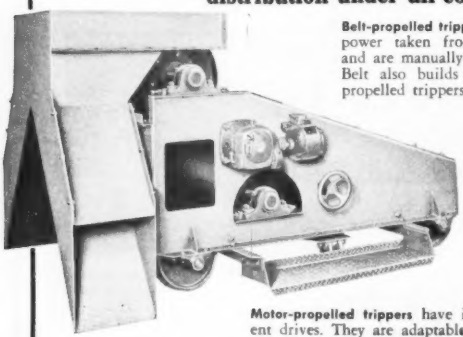
WHETHER you must move a few tons a day or several thousand tons per hour . . . whether the haul is measured in feet or miles—you'll find the answer in belt conveyors at Link-Belt.

Here's a nation-wide engineering organization that will follow through from start to finish—the designing, manufacturing, erecting of conveying equipment. And nowhere can you match Link-Belt's combination of vast application experience . . . complete line of quality components . . . expert coordination of related equipment.

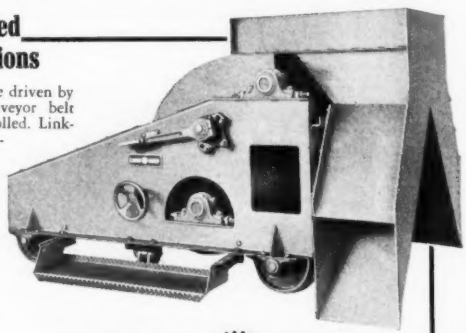
Get all the facts from the Link-Belt office near you. Link-Belt engineers are glad to work with you and your consultants—help you get the finest in belt conveyors.

LINK-BELT COMPANY: Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Houston 1, Minneapolis 5, Duluth, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8, Springs (South Africa). Offices in principal cities.

LINK-BELT Trippers offer controlled distribution under all conditions



Belt-propelled trippers are driven by power taken from conveyor belt and are manually controlled. Link-Belt also builds winch-propelled trippers.



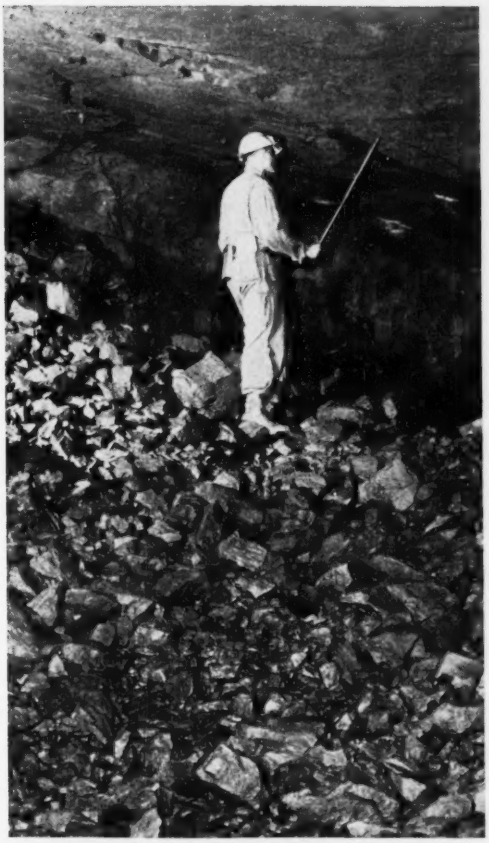
Motor-propelled trippers have independent drives. They are adaptable to automatic operation and control.

12,885-B

LINK-BELT

BELT CONVEYOR EQUIPMENT

BETTER BREAKAGE
WITH DU PONT "MS" DELAY CAPS
in Southern Iron Ore Mine



When the operators of a well-known southern iron ore mine switched to Du Pont "MS" (Millisecond)* Delay Electric Blasting Caps, they obtained greatly improved breakage. A typical example of the superior fragmentation is shown in the picture at the left. Loading machines like that shown below pick up the muck and transfer it to shuttle cars with a minimum of delay.

Better breakage naturally means increased production . . . cuts down costly secondary blasting. In addition, Du Pont "MS" Delay Caps reduce concussion . . . lessening damage to pillar walls and timbering. They also prevent cut-offs . . . assuring muck that is free from dynamite.

Like all Du Pont electric blasting devices, "MS" Delay Caps are made with waterproof rubber-plug closures, plastic insulated wires and aluminum foil shielded shunts . . . providing maximum safety.

More and more mine owners are finding Du Pont "MS" Delay Electric Blasting Caps an aid to more economical and efficient blasting. Why not try them in your own mining operations? Ask the Du Pont Explosives representative in your own area for complete information about these short-interval delay caps. He will be glad to help you with your blasting problems. E. I. du Pont de Nemours & Co. (Inc.), Explosives Department, Wilmington 98, Delaware.

**Available in 14 millisecond delay intervals MS-25, -50, -75, -100, -125, 150, -175, -200, -250, -300, -350, -400, -450, and -500.*

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Blasting Supplies and Accessories

DU PONT

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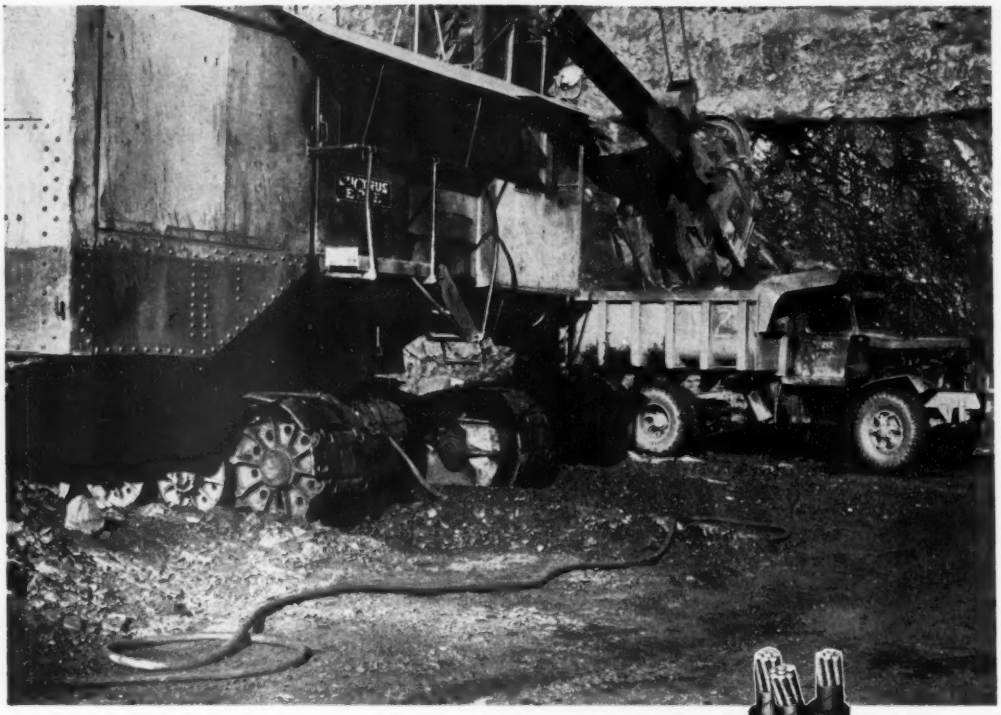

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HAZACORD shovel cables

These cables can take it—they have to, for backing up the big shovels is as punishing as any job a cable is called upon to perform. Continuous dragging over sharp rock, exposure to all kinds of weather, tortuous flexing, coiling — it's all in a day's work for shovel cables.

Among the six types of Hazacord shovel cables you'll find the one that best meets the requirements of your particular operation. Take, for instance, Type SH-D: Over each insulated conductor you'll find a copper shielding braid; properly grounded, it equalizes surface stresses and drains off all capacity charging currents to assure safe handling. In addition, the three grounding conductors provide an adequate low resistance ground for the equipment. Like all Hazacord shovel cables, Type SH-D has the protection of the tough Hazaprene ZBF Sheath—a mold-cured, double layer of Hazaprene for added resistance to abrasion, wear and tear. Recommended for use up to 15,000 volts, Type SH-D is the safest, most used design for high-voltage applications.

For full information on Hazacord's many features that are delivering money-saving service to more and more operators . . . for performance characteristics and specifications of each of the six Hazacord shovel cables, ask your Hazard representative or write Hazard Insulated Wire Works, Division of The Okonite Company, Wilkes-Barre, Pennsylvania.

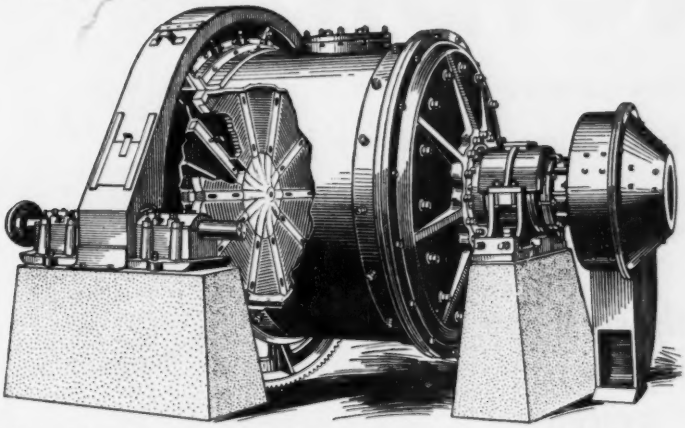
Hazard Type SH-D Shovel Cable

Embossed:
HAZAPRENE ZBF P-1048M

9847

HAZARD

the "low down" on grinding



It is gratifying to have been the first one to advocate and manufacture a grinding mill employing the low-pulp-line, rapid-circulation-of-mill-content principle, thru the use of a grate discharge...gratifying because of its wide acceptance.

This Marcy principle was first used 38 years ago. Following are some of the companies who installed Marcy Grate Discharge Mills *and placed repeat orders based on their performance.*

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Our grinding specialists will welcome the opportunity of showing you actual operating data on Marcy Grate Discharge Mills.

Other MASSCO products: Massco-Fahrenwald Flotation Machines, Genuine Wilfley Tables, Massco-McCarthy Hot Millers, Rock Bit Grinders, Density Controllers, Belt Feeders, Rubber Pinch Valves, Assay and Laboratory Supplies and Equipment, Complete Milling Plants.

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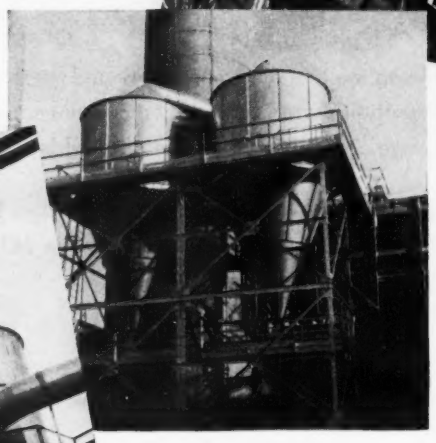
helps you to achieve outstanding efficiency in dust and fume collection

with these three important systems

Automatic Bag Type



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Norblo *Portable* Dust Collecting Units, bag or filter types, give you localized dust control. Comply with all state and city codes. Three sizes, six rating selections from 300 C.F.M. to 1350 C.F.M. Write for Bulletin 163-5.

Dust and fume control ranks high among the facilities considered necessary in modern industrial operations. Now you figure the economy of safeguarding against explosions — of increasing the general efficiency of your plant — of salvaging valuable fumes and dusts.

Norblo makes three principal types of collection systems — engineers each installation from first hand experience of 40 years in many industries. High-efficiency equipment having the correct factors to suit your needs includes the Norblo guarantee of performance, economy and low maintenance. Before you decide on any fume or dust collection equipment consult the Norblo engineering department.

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Engineered Dust Collection Systems for All Industries

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...TO MEET SPECIFICATIONS

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Custom Steel Makers to Industry
PRODUCERS OF FORGINGS, ROLLS, RINGS, CORROSION AND HEAT RESISTING CASTINGS

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As we listen to the latest insults from Moscow, we're likely to get fighting mad.

Instead, we'd better use our heads and get *working* mad.

It is clear by now that Stalin and his gang respect just one thing—strength. Behind the Iron Curtain they've been building a huge fighting machine while we were reducing ours. Now we must rebuild our defenses—*fast.*

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We can do this double job if we all work together to turn out more for every hour we work—if we use our ingenuity to step up productivity.

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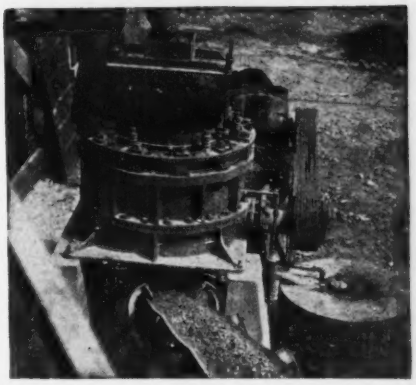
* Pronounced Que-Ken. U. S. and Foreign Patents Pending.



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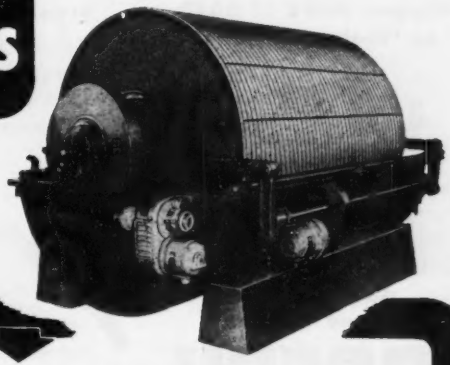

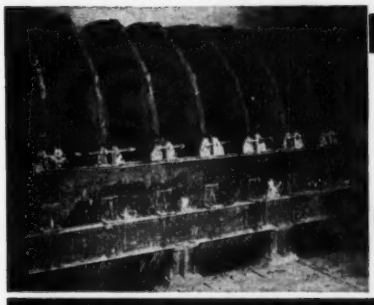

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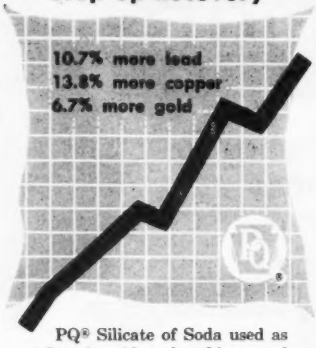

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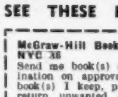

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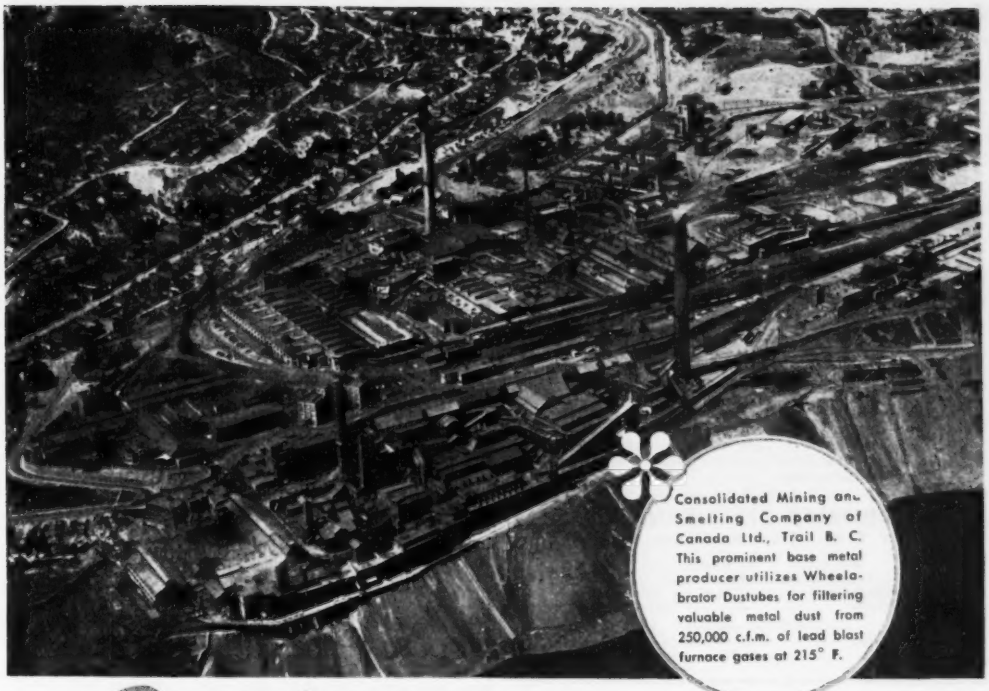

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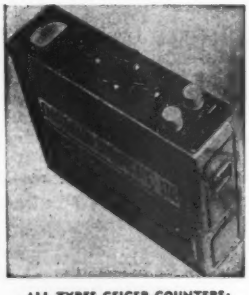

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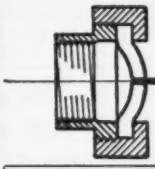

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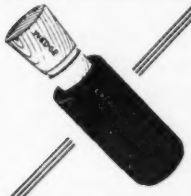

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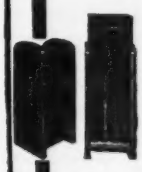

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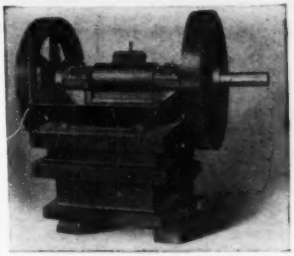
2—8 ton Goodman trolley, 36" ga.
1—5 ton Goodman trolley, 36" ga.



JAW CRUSHERS

2—8" x 12" Universal 2M
1—9" x 12" Cedar Rapids
1—8" x 24" Rogers
1—8" x 36" Universal
1—9" x 36" Cedar Rapids
1—13" x 24" Telsmith
1—15" x 28" Pacific
1—8" x 8" Universal
1—9" x 15" Farrell

MISCELLANEOUS EQUIPMENT

1—Ingersoll-Rand wagon mounting drill type FM2 mounted on 2 rubber tired wheels.
1—27" x 14" MacFarlane crushing rolls.
1—54" x 26' rotary dryer.
1—150 HP Vulcan single drum-hoist complete with motor and controls.

SAND PUMPS

1—1" Wilfley sand pump
2—2" Wilfley sand pumps.
1—2" Denver vertical sand pump
3—2" Telluride sand pumps
1—2½" Traylor sand pump
1—3" Allen-Sherman-Hoff rubber lined hydro-seal
1—3" Wilfley sand pump
1—3" Telluride sand pump
1—4" Allen-Sherman-Hoff hydro-seal
1—4" Denver vertical sand pump
1—6" Wilfley sand pump

TUGGER HOISTS

1—Dillon-Box model 3 single drum air tugger.
1—Ingersoll-Rand model 6 HC single drum air tugger.
1—Ingersoll-Rand size 5NN-01-1 2 drum electric slusher hoist.
1—Sullivan class RH single drum electric tugger.
1—Ingersoll-Rand size 107 single drum electric tugger.
1—Sullivan model D211 2 drum electric slusher hoist.
2—Sullivan type HE D.C. single drum electric tuggers.
9—Sullivan type HDE D.C. double drum electric slusher hoists.
1—Sullivan model HDE 10B 2 drum tugger hoist direct driven by 4 cyl. Continental gas engine.

GRINDERS & SHARPENERS

1—Ingersoll-Rand new jackbit grinder size JA4 air driven.
1—Mossco type G rockbit grinder with 5 HP motor.
1—Ingersoll-Rand bit grinder J3 with 3 HP motor.
1—Ingersoll-Rand bit grinder model JO3 driven by Wisconsin gas engine.
1—Ingersoll-Rand #50 drill sharpener.
1—Ingersoll-Rand #40 drill sharpener.
1—Ingersoll-Rand #5 drill sharpener.

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ESTABLISHED 1898

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P.O. BOX 1708 — DENVER, COLORADO, U.S.A. — CABLE "MORSE"

COMPLETE ORE-MILLING PLANTS — CONCENTRATION — FLOTATION MACHINERY — CYANIDE — AMALGAMATION

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NEW AND RECONDITIONED EQUIPMENT

Ball Mill 5' x 4', steel shell, good liners friction clutch V-belt pulley new US motor 40HP 440V 3Ph 60 Cy 1200RPM w/starter
Ball Mill 5' x 10' new liners w/FM motor 75HP 440V 3Ph 60Cy 1200RPM
2 Ft Symons standard cone crusher new US motor 30HP 440V 3Ph 60Cy 1200RPM w/starter
Assay Furnace DFC 4411 single muffle complete w/blower 1½HP motor 220/440V 3Ph 60Cy 3500RPM; extra Carbofax muffle
Westinghouse Motor 100HP 440V 3Ph 60Cy 580RPM V-belt drive w/125/200 HP Whse auto-starter
Mine Hoists; Mine Cars, 18,20,30 cu ft; Flotation Machines; Jigs; Classifiers; Analytical, Pulp and Bullion Balances

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MINING & INDUSTRIAL EQUIPMENT
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ELECTRICAL CABLE

- for every industrial and power application.
- Special construction. Odd lengths.
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Crusher: 4 ft. Symons cone
Crusher: 2 ft. Symons cone.
Ball Mill: 6x6 Colo.I.Wks; 440-v v-belt-dr. slipring motor
Ball Mill: 5 ft. dia. x 4 ft.
Flotation: 4 Cells 24x24 Sub-A; 220/440-v motors
Motor Pump: Ingersoll 1½ MRV25; GE 220/440-3600 rpm 25 hp motor.
Mine Hoist: 2-drum 60" dia. 440-v; capacity 12000# at 600 FPM.
Mine Hoist: Vulcan 1-drum 36" dia. 75 hp GE 440-v motor.

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10—250,000 C.F.M. Buffalo ventilating fans — type LLD, double width, size 15, class 1, clockwise rotation, top horizontal discharge, arrangement 3, with sleeve bearings. Excellent Condition.

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ROTARY KILN 6' dia. x 30' long, 24" dia. x 18' long, 4½' dia. x 45' long.
PULVERIZERS Wms. LG 25, Raymond #1 w/ cyclones, Sturt. #1 Ring Roll, Brad. Herc. Jr., Cedar Rapids 4035 Portable.
CRUSHING ROLLS: 12x12, 16x10, 30x14, 48x16, 54x24.
CRUSHERS: Jaw, 8x14, 14x26, 24x40, 36x18
MILLS, HARDINGE 7'x48", 8'x22" w/ motor driven.
HYDRATOR — Lime-Kunts, continuous.
CENTRIF. PUMPS — New — to 750 gpm — stock.
DRY PANS — 7' and 9' dia.
TANK 8' x 32' Hor. steel, 12,000 gal.
DORR THICKENERS — 12' x 8'.
ELEC. MOTORS, 50/75/100/150 HP Slip ring.

LAWLER COMPANY
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Metuchen 6-0245 N. J.

AIR COMPRESSORS
9 Electric 1,000, 3,665, 3,178, 2,200, 1,578 & 1,302 1,000 CFM & 500 Ft.
6 Diesel 1,578, 1,000, 678 & 500 Ft.
LOCOMOTIVES AND CRANES
12 Diesel 100, 90, 65, 45, 30, 20 Ton Locomotives.
22 Gas. 35, 25, 18, 12, 9 & 6 Ton Locomotives.
40 Ton Orton Diesel Locomotive Crane.
R. R. CARS
100 Dump Cars, 2, 4, 12, 20 and 30 Yd.
100—60 Ton Flat Cars. 60—50-Ton Gondolas.
150—8,000 & 10,000 Gal. Gas. Tank Cars.
TUNNEL MUCKERS — LOADERS
4 Gardner Denver 600 & 6D14.
10 Elmco 12B & 21, 4 Sullivan HL3B.
LARGE JAW CRUSHERS
7—60"x84", 40"x48", 30"x42", 24"x36" & 28"x36".
ROTARY DRYERS AND KILNS
48"x20', 48"x45', 54"x40', 60"x50', 70"x45', 80"x80', 84"x50'.
Single and Double Shell.
Kilns, 6'x80', 4'x45' & 8'x170'.
BALL, ROD & TUBE MILLS & CLASSIFIERS
3—6'x22' A.C. Tube Mills
5'x22', 6'x22', 6'x48', 8'x22' & 8'x36' Hardinge Conical Ball Mills.
4x4, 6x6 & 7x8 Cylindrical Ball Mills.
6', 10' & 16' Mechanical Air Separators.
36" & 70" Spiral and 4' Dorr Rake Classifier.
4x10, 5x12, 7x10 Rod Mills, Marcy, Hardinge.
Cottrell Precipitator 108,500 CFM.
Dings 2-stage 18" Wetherill Mag. Separator.
200, 400 & 700 HP—Double Drum Mine Hoists.
75, 200, 400, 500 & 700 HP Single Drums.
STEEL STORAGE TANKS
46—10,000 Gal. R. R. Car Tanks.
PULVERIZERS
Hercules Jr. & #1 & 2 Ring Roll.
STANHOPE, 80 E. 42nd St., New York 17, N. Y.

1—#1 Raymond Mill
1—13" McCully Superior gyratory crusher.
Rotary Dryers—3' x 30'—4' x 30'—4' x 40'—5½' x 50'—6½' x 80'—8½' x 70' & 7½' x 70'.
Tube & Ball Mills—6' x 9'—5' x 22'—5½' x 18'.
Fuller-Lehigh Mills—22'—47" & 52'—Bradley Mills.
Jaw Crushers—From 10" x 6" up to 30" x 24".
Crushing Rolls—From 12" x 24" up to 72" x 20".
1—Complete Linel Hydrating Plant.
Sturtevant Rotary fine crushers—No. 0—No. 1—No. 1½ and No. 2.
Ring Roll Mills—Sturtevant No. 1—No. 2 duplex.
15'—16' & 18' Horseshoff furnaces.
Gyratory Crushers, No. 3 to No. 12.
5' & 8' Gayto — Air separators.
Magnetic separators—Jigs—screens—classifiers and thickeners.
5'- 6" & &7' dia. Rod Mills. Mine Hoists.
8' x 10'—8' x 12'—11½' x 19' Rotary Filters.
1—8' Raymond "Whizzer" Separator.
New Dryers and Kilns.

W. P. HEINEKEN, INC.
50 Broad Street, New York

1—#64½ Marcy Ball Mill with new Mang. Breast Liners
1—30" x 48" Baker Ball Mill
1—9" x 40" Austin-Western Jaw Crusher
1—10" x 20" Allis-Chalmers Blake Type Jaw Crusher
1—6" x 12" Wheeling Jaw Crusher
1—8 cell #24 Denver Sub-A Flot Machine—wood tank
1—20' x 10' Thickener Mechanism with wood tank
1—#21½ Vulcan Sgl. Drum Hoist direct geared to U-6 Gasoline Power Unit
1 18" Belt Conveyor, 35' long
1—Bucket Elevator, 6 x 4 x 3 Buckets on 8" Belt, 20' long driven by 3 HP Gear Motor
1—12" Jeffrey Blower Fan with 1½ HP AC Motor
1—15 HP AC Slip-ring 1150 RPM Motor
2—20 HP Gen. Elec. Slip-ring 1200 RPM
1—30 HP West. Slip-ring 840 RPM
1—35 HP AC Slip-ring 850 RPM
4—1 HP West. Squirrel Cage 1200 & 1800 RPM
1—2 HP Louis-Allis Squirrel Cage 1140 RPM
5—5 HP Gen. Elec. Squirrel Cage 860 to 1800 RPM
2—10 HP Gen. Elec. BB Squirrel Cage 1160 RPM
5—15 HP Gen. Elec. BB Squirrel Cage 1160 RPM
3—20 HP Gen. Elec. BB Squirrel Cage 1170 RPM
1—25 HP Gen. Elec. Squirrel Cage 600 RPM
1—25 HP Gen. Elec. Squirrel Cage 1200 RPM
1—25 HP Crocker-Wheeler Squirrel Cage 1740 RPM
1—50 HP West. Squirrel Cage 1710 RPM
New and Used Single Phase Motors from ¼ HP to ½ HP.
1—32" x 16" Davis Crushing Roll
1—5 turn #24-A Humphrey Concentrator
1—16" Belt Feeder, 8' long — Motorized
1—18" dia. x 26" face Dings Magnetic Pulley with mech. and charger
1—7½ KVA West. Transformer 440-110/220 volts
1—3 KW West. Transformer 440-110/220 volts
3—37½ KVA Pittsburgh Transformers 440/110/220 volts
20 Tons 85# Rail
10 Tons 65# Rail
Several Tons C. I. Pipe 4" to 8"

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DEPENDABLE DIESEL ELECTRIC POWER UNIT

500 H.P. G.M.C. DIESEL
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WORTHINGTON AIR COMPRESSOR
INGERSOLL RAND AIR FILTER

This unit cost the federal government more than $60,000.00

COMPLETE PLANT ONLY $15,000

10 Per Cent Discount for cash. Credit terms can be arranged.

A dependable and economical power unit for factory, mine, small town light plant.

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60 CYCLE ELECTRIC MOTORS
from $5.00 to $10.00 per horsepower
25 CYCLE ELECTRIC MOTORS
from $5.00 to $8.00 per horsepower
Almost all sizes — — Call on us for quotations.

ITEM	
1.—#4 Universal Hammermill - good	$ 850
2.—#2 Allis Chalmers gyratory crusher	395
3.—#3 Allis Chalmers gyratory crusher	495
4.—#5 Austin gyratory crusher - excellent	2,000
5.—9 yard bottom dump (hydraulic) Misc. Rock wagon - Heavy rock grip tires - a 6,000 value	850
6.—Heavy duty army surplus 2 wheel trailer. 900 x 20 tires, Cap. 5,000#, Cost $1,500	195
7.—Late TD9 International crawler tractor with Hough loader and dozer blade, rebuilt Located in Florida - - - A Bargain at	4,000
8.—Good Allis Chalmers HD14 tractor Hydraulic blade—Located in Florida	4,000
9.—Late TD9 International crawler tractor with Hough loader and blade—Only 1,000 hours	4,500
10.—Sullivan HL3 rocker shovel in operating condition, 24" gauge	550
11.—Al. Chal. 60 H.P. Heavy duty industrial power unit, complete with outboard bearing	595
12.—Allis Chalmers 60 H.P. Heavy duty industrial power unit. Reconditioned	650
13.—Waukesha 60 H.P. Industrial Power unit, complete electric start, Butane or gasoline	695
14.—Atlas Imperial Diesel 120 H.P. - Outboard Bearing. Real bargain	1,000
15.—Int'l. diesel PD40 Power unit - Fair cond.	375
16.—International diesel UD18 - 180 H.P.	1,750
17.—40 50 H.P. Fairbanks Morse vertical diesel Bargain	395
18.—Hercules 25 H.P. Industrial Power unit	295
19.—General Motors truck diesel 4-71—Late model (includes transmission)	500
20.—1. ft. port. compressor - 110 C.F.M. Rebuilt	650
21.—Schramm 105 portable on pneumatic tires	

STARTERS - SWITCHES - COMPENSATORS
ABOUT ½ PRICE
TRANSFORMERS ..... $5.00 per K.V.A.
VERTICAL MOTORS FOR TURBINE PUMPS
Samples:

Almost new	150 H.P.	$1,750
Good	100 H.P.	750
Fair	150 H.P.	750
Excellent	25 H.P.	250
Excellent	50 H.P.	500

Mechanic special	150
22.—Late model Ingersoll Rand K105 portable compressor — Mechanic special	500
23.—Ingersoll Rand Imperial — Type 10, 600 C.F.M. stationary compressor	995
24.—Chicago-Pneu. 401 CFM stationary compressor	495
25.—(2) Chicago Pneumatic 401 CFM stationary compressor - natural gas heaad, each	495
26.—Refrigeration compressor (Clayton)—a $500 value	100
27.—Refrigeration Compressor (Bayer)—a $500 value	100
28.—Ingersoll Rand 315 CFM portable compressor, gasoline or butane	1,750
29.—(2) I. R. DA35 auto. feed drifter drills, ea.	395
30. Gardner-Denver 4" automatic feed drifter drills — Closeout 1 only	195
31.—Steel rougher jig — 7 coil plunger type, split feed, could be converted to combination rougher-cleaner. Reproduction cost $6,000	1,000
32.—(4) 42"-48" Skips for slusher hoists with detachable bindes. Closeout each	65
33.—New Ingersoll Rand 3 drum slusher hoist, 20 H.P. — List — less $500	
34.—Used I. R. 3 drum slusher hoist, 25 H.P.	1,850
35.—Used Sullivan 2 drum slusher hoist, 7½ H.P. — electric — Bargain	495
36.—Triplex pump—5". Excellent	395
37.—New television sets—Closeout Mark 21" Console deluxe	200

CRUSHERS, JAW: Sizes 12" x 15' to 48" x 99".

CRUSHERS, REDUCTION TYPE: Symons 3 ft., 4 ft. and 5½ ft. with short heads and fine bowls, with motors and drives. 1—Symons 2 ft. with coarse bowl. 1—Telsmith 48" Gyrasphere with 150 H.P. motor. 1—Telsmith 13" and one 16" with motors and drives.

PORTABLE CRUSHING PLANT: Cedar Rapids 10 x 36" all steel Jaw Crusher, 16" dia. Rolls, Steel Bin, Chain bucket Elevator, Vibrator Screen, with 100 H.P. Electric motor or 122 H.P. D13000 Caterpillar motor.

DRYERS or KILNS: 3—10 ft. x 90 ft., heavy duty, with or without auxiliary equipment, condition like NEW. 1—Kiln 4 ft. dia. x 65 ft. complete with all equipment, oil fired, like NEW. One of the above located in Minnesota.

CLASSIFIERS: 4—Akins 54" double pitch, single screw, high weir, 3 H.P. synco-gear motor, 220/440 volt, lifting device 1½ H.P., NEW condition. 2—Wemco 78" double pitch, single screw, high weir, 7½ H.P. motors, 220-440 volt, speed reducer and lifting device. Three of above items located near Reno, Nevada. 2—Dorr 8' x 39' rake, 10 ft. dia. bowl and 22 ft. bowl, with motors and drive, NEW 1951, slightly used.

PULVERIZERS: Marcy 8 ft. x 12 ft. Rod Mill, with motor and drive, new 1950, with 30 ton 4" x 12 ft. rods. Hardinge Mill 5' x 22", manganese lined for dry grinding, complete with 30 H.P. motor, 220/440 volt, and feeder. Sturtevant Ring Roll Mill size 1½ with large list of new parts.

AIR SEPARATORS: Gayco, Sturtevant, Raymond and Bradley. 4 ft., 6 ft., 8 ft. and 16 ft. with motors.

MINE HOISTS: 1—Vulcan single drum, 3' dia., 2'6" face, 75 H.P., 220 volt, NEW condition. 1—150 H.P., 6'6" dia., 6'8" face. 1—200 H.P., double drums, one clutched, 8 ft. dia., 4 ft. face. 1—250 H.P., 72" dia., 48" face. All 3 phase, 60 cycle, 2200 volt with control equipment. Head frame for double shaft 16'9" x 17'2", height 55 ft., with or without 8 ft. dia. sheaves for 1½" rope. 1—950 H.P., double drums, 14' dia., 6'10" face, 1⅞" rope, 1500 FPM, complete with 950 H.P. motor and controls. Other hoists 100 H.P. to 1050 H.P., single and double drum with electric equipment.

MOTORS: 2—NEW Pump Motors 1000 H.P., 1800 RPM, 2200 volt, drip proof, with automatic switch gear. NEW. UNUSED. 1—850 H.P. Hoist Motor, 2200 volt, 443 RPM, with controls.

COMPRESSORS: Worthing DC2, 20/18½ x 21, motor 600 H.P. synchronous, 440 volt, with all auxiliary equipment. 4—Ingersoll Rand diesel, portable, 500 cu. ft. @ 100 lbs. pressure, new 1951.

BLOWER: Connersville 8000 CFM, 1½ lbs., 18" x 54", type RCS, 75 H.P., 2200 volt, roller bearing motor and control. New 1951.

LOCOMOTIVE, ELECTRIC: 10 ton Goodman, trolley type, 250 D.C., 36" gauge.

SHOVEL, ELECTRIC: Bucyrus Erie 4 yd. capacity, 2200 volt.

LOG WASHERS: 3—25 ft., heavy duty, double log, hutch or standard, complete, rebuilt.

BOOT BUCKET ELEVATORS: Buckets size 12" x 7" on chain, 23 ft., 40 ft. and 48 ft., with motors and drives.

BRIQUETTING PRESS: Komarek & Greaves 33" dia. rolls, 500 cups per roll, excellent condition, 50 H.P. motor, with quantity of new spares.

A. J. O'NEILL

Lansdowne, Pa.
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FOR SALE

2—MARCY ROD MILLS

5' x 14', good condition, including 2 Falk Speed Reducers, Type 9 HC, 100 H.P. Price $12,000.00 each.

COMBINED LOCKS PAPER CO.

COMBINED LOCKS, WISCONSIN

FOR SALE

New No. 4 MACE copper ORE smelting furnace. Packed for immediate delivery in U.S.A. Charge capacity 50 to 65 tons daily. Payment at reduced price in either dollars or British pounds. FS-3698 Engineering & Mining Journal, Aldwych House, Aldwych, London, W.C.2, England

MOTORS—M. G. SETS—TRANSFORMERS

SQUIRREL CAGE MOTORS
3-Ph., 60-Cy.

Qu	HP	Make	Type	Volts	RPM
1	400	Cont.	NZ-906	2300	1200
1	400	G.E.	IK	2200	514
1	400	G.E.	KT-412	2200	435
1	300	Whse.	CS-890	2300	1780
1	200	Whse.	CS-873C	2200	1160
1	200	Al.Ch.	AR	440/220	580
2	125	Al.Ch.	AR	2200	1750
1	125	Whse.	CS-761C	440/220	1750
1	125	C.W.	126-Q	440/220	430
2	100	Whse.	CS-663C	440/220	1750
1	100	Al.Ch.	AR	550	690
1	100	F.M.	H241B	440/220	435
1	100	Whse.	CS-938	2200	495
1	78	G.E.	I-K15	440/220	570
1	75	Al.Ch.	AR	2200	1765
1	75	Al.Ch.	AR	2200	1750
1	75	Al.Ch.	AR	2200	690

SYNCHRONOUS MOTORS
3-Ph., 60-Cy.

Qu	HP	Make	PF	Volts	RPM
1	2500	Whse.	80	2300	720
2	2100	G.E.	100	2300	360
2	1750	G.E.	100	2300	3600
1	750	G.E.	80	2300	450
1	187	G.E.	80	220/440	720
1	150	G.E.	100	2200	900
1	150	G.E.	100	550/2200	600
1	150	G.E.	80	550/2200	450
3	135	G.E.	80	400/2200	1200
3	125	El.Mchy.	100	4800/2400	900
1	125	G.E.	80	2200	900
2	100	Whse.	80	440/220	1800
1	100	Whse.	100	2200	1200
1	100	Ideal	80	220/440	900
2	100	G.E.	80	220/440	600
1	60	G.E.	80	220/440	1200
2	50	G.E.	80	2200	600

SLIP RING MOTORS—CONSTANT DUTY—3-Ph., 60-Cy.

Qu	HP	Make	Type	Volts	RPM
1**	1200	C.W.	SR	2200	257
2**	1000	Al.Ch.	ANY	2200	235
1**	600	G.E.	MT-20	2200	360
2	500	G.E.	I-16-M	2300	450
1**	400	Al.Ch.	ANY	2200	514
2	400	G.E.	MT-412	2200	450
1	300	G.E.	I-15-M	2200	1200
1	300	Al.Ch.	ANY	2200	514
1	250	G.E.	MT-414	2200	300
1	200	G.E.	I-16-M	2200	585
1	150	G.E.	I-13-M	2200	1750
1***	125	Whse.	CW-870	2200	870
1	100	F.M.	H20C	440/220	900
1	75	G.E.	IM	440/220	695
1	75	Whse.	CW-7540	440/220	690
1	60	Whse.	CW	440/220	900
1	50	G.E.	MT-536	2300	1150
1	50	F.M.	8R	440/220	600
1	40	Al.Ch.	ANY	2300/440	435

** Mill type pedestal bearing. *** 3-Bearing

In our stock you will find manual and magnetic primary and secondary controls 10 to 3000 lbs., which we can furnish complete for any requirements.

MOTOR GENERATOR SETS

Qu	KW	Make	RPM	Volts DC	Volts AC
1	2400(3-U)	Al.Ch.	720	525	4800
1	2400(3-U)	Whse.	720	600	4800/2400
1	1000	G.E.	514	550	2300
2	500	C.W.	720	575	2300/440
1*	500	C.W.	720	250/275	2300/440
1	500(3-U)	Whse.	1200	250	440
1	250	Whse.	1200	125/250	2300
1	200	Whse.	1200	125/250	2300/440
1	200	Ridgway	900	275	2200
1	155	G.E.	720	250	2300/440
1	150	G.E.	1200	500	2300/440
1	100	Al.Ch.	1200	125/250	4000/2300
1	100	Delco	1200	125/250	440/220
1	100	C.W.	1200	125	440/220
1	100	Ridgway	1200	275	4000/2300
1	85	C.W.	1200	250	4000/2300
1	75	Star	1200	230	440/220
1	75	Whse.	900	75	2200
1	75	Al.Ch.	1200	250	2300
1	50	Burke	1750	250	440/220
1	35	Whse.	1750	250	440/220
1	25	Ideal	1750	125	220
3	20	Al.Ch.	1200	250	440/220

DIRECT CURRENT MOTORS

Qu	HP	Make	Type	RPM
1***	3000	Whse.	Encl.(Rev.)	600
1***	2400	Whse.	Encl.(Rev.)	600
4***	1800	Whse.	Encl.(Rev.)	600
4***	1200	Whse.	Encl.(Rev.)	600
4***	800	Whse.	Encl.(Rev.)	600
1	350	G.E.	CD-169-A	1150
1	300/350	El.Dy.	No. 22	400/1200
1	250	G.E.	MPC	325/975
1***	200	G.E.	MPC	500/1200
1	200	Whse.	Mill	300/1200
1	180	G.E.	MPC	430
1*	150	C.W.	83-H	890
1***	125	Whse.	SK-180	600
2	125	Whse.	SK-184	575/850
1	100/125	Rel.	1995-F	300/1200
2	100	Rel.	1040-T	400/1200
1	90/160	G.E.	MPC	625/1125

All above 230-VDC except where marked ***.
*** Pedestal bearing mill design 525/600-VDC.
Rev. designed for mill reversing service.
* T.E.F.C.

We have in stock 100 magnetic panels which we can furnish arranged for your particular requirements.

FREQUENCY CONVERTER SETS

Qu	Make		
1	750-KVA	Elec.Mchy.	440/3/60 to 440/3/180
3	1200-KW	G.E.	2300/3/60 to 460/3/30
1	1700-KVA	Whse.	2300/3/60 to 2500/3/24

The above complete with control panels and starting equipment.

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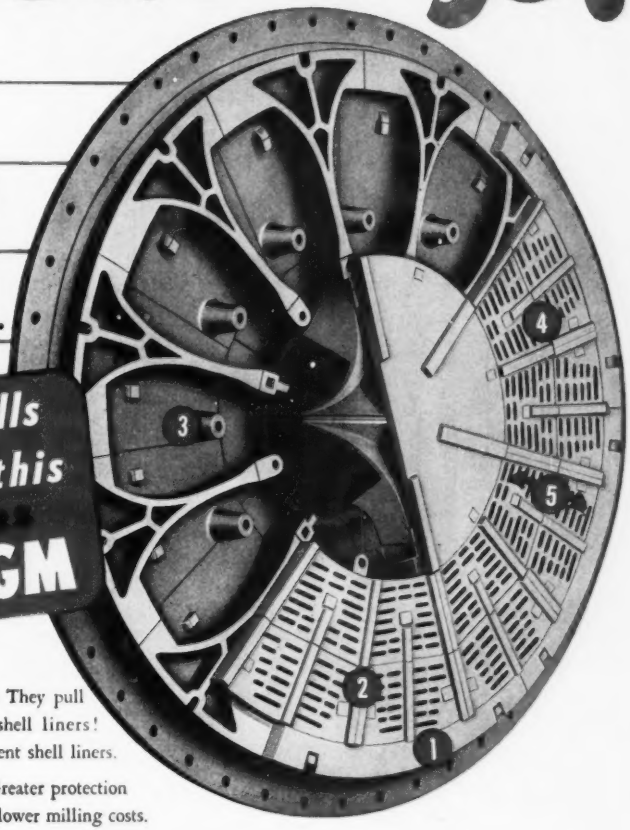

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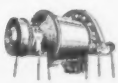
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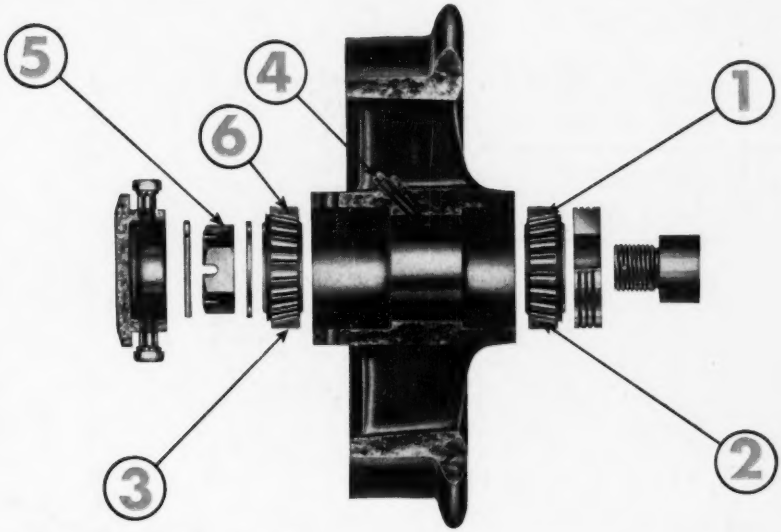

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